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A Critical Analysis of Water Rights and Institutional Factors and Their Effect on the Development of Logan River

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A CRITICAL ANALYSIS OF WATER RIGHTS AND INSTITUTIONAL FACTORS AND THEIR EFFECT ON THE DEVELOPMENT OF LOGAN RIVER

by

Frank W. Haws

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Frank W. Haws

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A Critical Analysis of Water Rights and

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by

Frank W. Haws, Master of Science

Utah State University, 1965

Major Professor: Dr. Jay M. Bagley
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The physical setting of the Logan River Drainage Basin is first described with emphasis on the hydrologic and climatic factors that made the river an economic and social benefit.

The historical development of the river by man is then traced, and changes in water use patterns are pointed out. Methods used to administer water rights as water use patterns change is then described.

Legal controversies over water rights on the river are examined and methods of solving problems analyzed. A recent law suit between Logan City Corporation and the Logan River Water Users Association is examined in detail and the benefits resulting from the litigation noted.

Drilling four new wells to supplement the City supply avoided costly judgments and benefited all users.

(152 pages)

INTRODUCTION

Professor Samuel Fortier, an early leader in the field of irrigation engineering, began, in 1895, to make a series of measurements of the amounts of water flowing in several of the streams and canals near Logan City in Cache County, Utah. Fortier was conducting research for the Utah Agricultural Experiment Station to define the needs for water of irrigated agriculture and to inventory the available water resources in some of the western watersheds. His data represent the first known measurements of river flow in Cache Valley, and the beginning of scientific investigation into the water resources of the area.

When Fortier plotted the first hydrograph of Logan River, he was astonished to note that long after winter snows had receded and disappeared, the flow in the river continued. He concluded that Logan River received water through the mantle of earth covering the watershed. This water, which he referred to as "seepage" water (13), created a rather substantial base flow in Logan River.

Fortier visualized the economic potential of such a river. He knew that with a large base flow and with a steep gradient many acres of land could be irrigated and that there was a possibility of producing electric power at the same time. To quote Fortier, "there flows past the city of Logan, one of the finest streams in the West!" (15).

Fortier was also aware that disputes over the rights to use water were likely to arise. At the time he made his study there was still undeveloped water in Logan River. He estimated that 189 cfs was sufficient water to satisfy all users and yet he was impelled to say (14),

> . . . the wisest course to pursue is to collect and record all the physical data possible pertaining to the capacities of the irrigating ditches, the areas watered by each, and the general behavior of all sources of supply. To put off the collection of such data until litigation has begun and then attempt to render court decisions upon the conflicting testimony of interested witnesses without full knowledge of the physical facts would be unwise.

The truth of Professor Fortier's statements was made plain when, 25 years later, he returned to Logan to testify as an expert witness before the first district court which was then engaged in a five-year-long battle to determine the rights to use water in Cache Valley (46).

Today, the need for adequate facts has not lessened. A need to know the "general (and sometimes specific) behavior of all sources of supply" still exists. To avoid dispute and to apportion the limited supply of water to the ever increasing demand, water administrators must have facts concerning man's uses of and requirements for water. Seventy years have passed since Professor Fortier made his investigations, but our knowledge of the river system today may be no closer to the truth than his was. The time that separates the present from the days of Fortier is also the element that gives the present the

advantage. With the passing of time, a wealth of information has been accumulated. Observations of changes that have occurred can now be made in streamflow and precipitation behavior, in water use patterns, and in the politio-socio institutions that regulate, motivate, and administer the rights to benefit from natural resources.

In the present study an attempt will be made to learn: (a) the behavior of the sources of supply, (b) the changes that have taken place historically in man's use of water, and (c) the evolution of the present system of administration of the rights to use water. In connection with the latter, a recent conflict between users will be studied and the results will be analyzed.

It is hoped that the results of this study will give a better understanding and appreciation of democratic institutions, and that through this study of the past the reader may gain insight into future changes and how best to cope with them.

HYDROLOGY OF LOGAN RIVER

Physiography

Logan River is located in northern Utah and southern Idaho near the 42° north latitude and 112°-00 west longitude, Figure 1. The river drains an area of about 223 square miles. This area is bounded on the west by the Bear River range of mountains and on the east by a portion of the Wasatch Mountains. The two mountain ranges converge to form the north boundary while the south boundary is formed by Logan Peak and a low range of hills extending eastward and separating the Logan River from the Blacksmith Fork River. The northern part of the drainage area opens into a wide valley with gently undulating hills. The river is not deeply entrenched and the grass covered hills provide excellent grazing for cattle. Near the center of the drainage basin the valley converges into a narrow steep canyon with the river deeply entrenched. This canyon continues until the stream emerges from the mountains onto the level floor of Cache Valley. The canyon at this point is nearly one mile deep.

The river meanders across Cache Valley, is joined by the Blacksmith Fork River and the Little Bear River and then joins Bear River, which is the major stream flowing through Cache Valley and into Great Salt Lake. Cache Valley was once a part of ancient Lake Bonneville, which deposited the huge mass of fine textured material

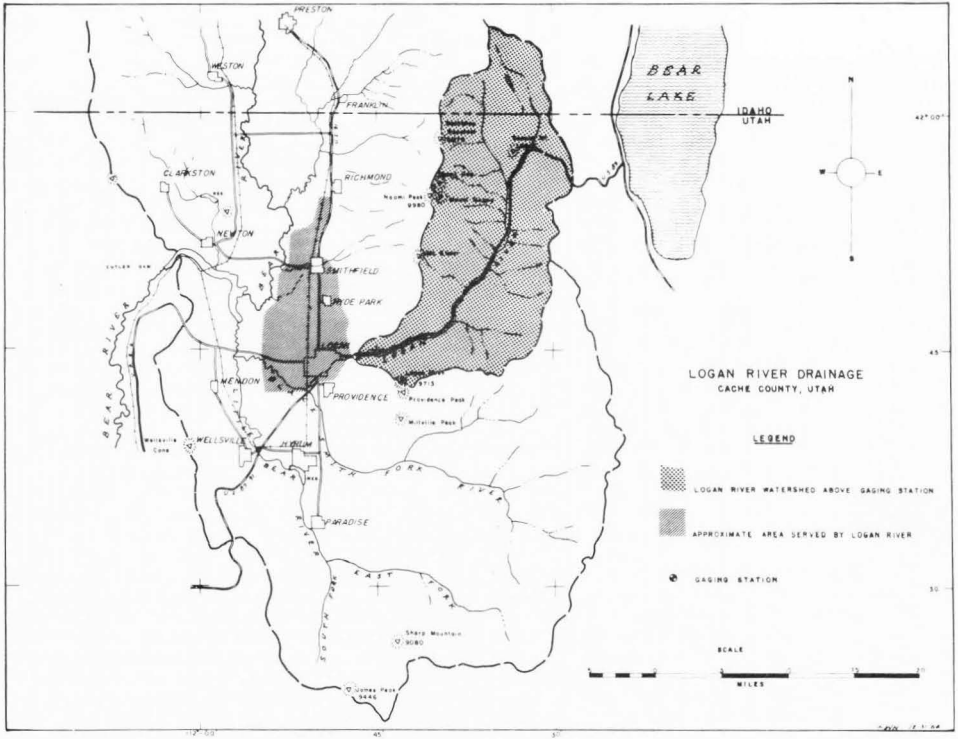

Figure 1. Map of Logan River drainage area

that now makes up the level, fertile valley floor. The valley is about 10 miles wide and 50 miles long and contains terraced bench lands near the mountains that are typical of the ancient lake formations. The valley floor has an elevation of about 4,500 feet above mean sea level. The terraces rise to an elevation of approximately 4,800 feet, from which the mountains abruptly ascend to an elevation near 10,000 feet.

The high mountains forming the western boundary of the drainage basin of Logan River are effective in extracting precipitation from the moist Pacific air masses as the air moves eastward toward the continental divide. The highest peaks in the area are Naomi, Mt. Gog, Mt. Magog, Double Top, and Mount Logan, all of which are over 9,500 feet high. The eastern boundary of the drainage area, which divides the drainage between Logan River and Bear Lake, is not as high, having a mean elevation near 8,500 feet.

The topographic features of the drainage basin are shown in Figure 2. Areas between successive 100-foot contour lines have been shaded so that the areal distribution of elevation can be visualized. The physiographic features and dendritic drainage pattern are shown in Figure 3.

Geology

The availability and distribution of water within a drainage area are affected by the geology of the area. The source of supply for all water within an area is precipitation; but the amount and rate of runoff

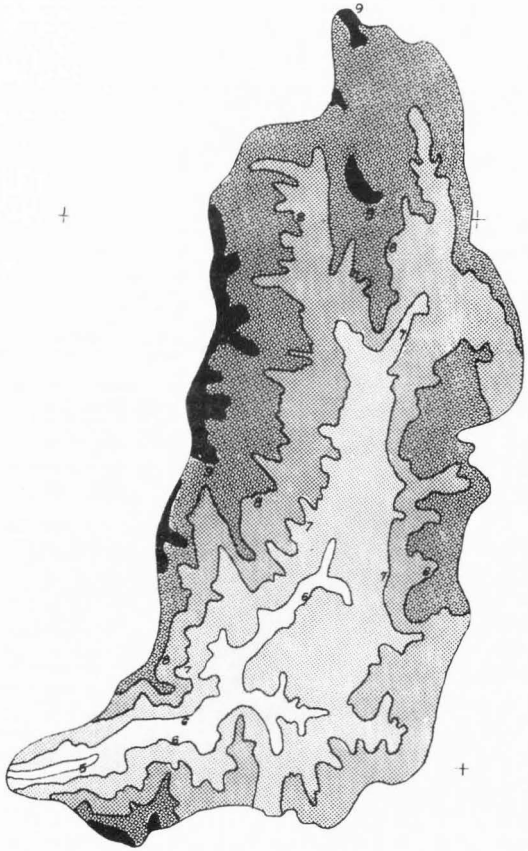

Figure 2. Areal distribution of elevation. Logan River Drainage area.

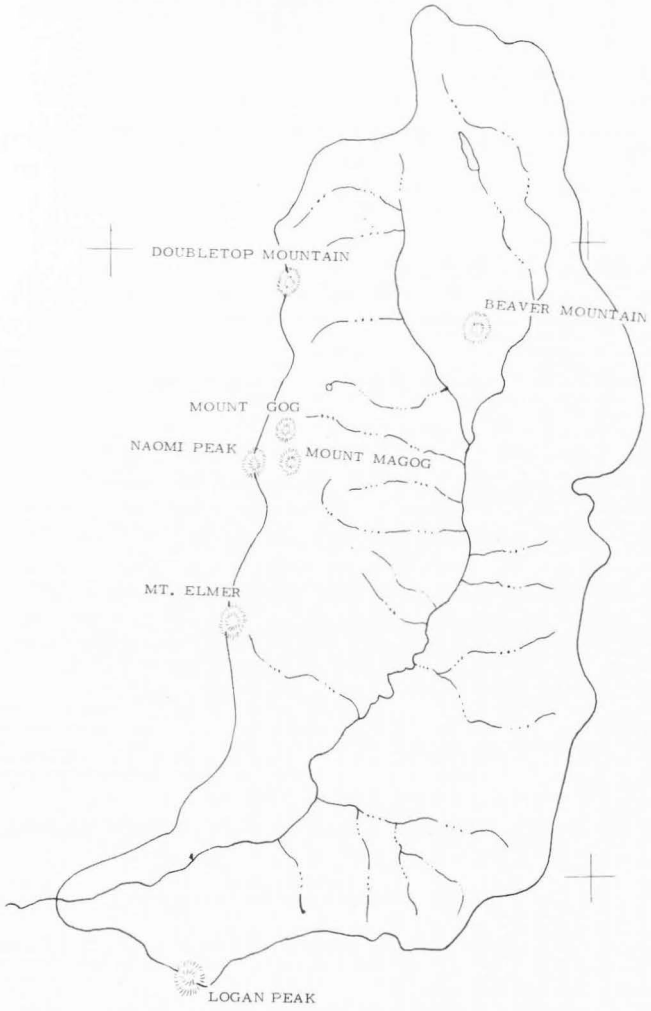

Figure 3. Surface drainage pattern of the Logan River drainage area

depends, among other things, upon the absorptive character of the mantle rock. Groundwater flow and seepage water storage within the mantle are both part of the geologic characteristics of an area.

Some of the characteristics peculiar to Logan River are shown in Figure 4, which is a schematic drawing of a section through the valley fill and the mountainous region. The mountains, which form the collecting area for Logan River, consist of Paleozoic formations ranging from Precambrian to Pennsylvanian in age and are composed chiefly of sandstone, limestone, and dolomite (49).

The mountains are part of a broad syncline with the trough lying directly beneath the crest of the high peaks and bearing in a northeasterly direction. The strata dip generally toward the trough and range in steepness from 55° to 10°. This type of formation is relatively nonabsorptive and generally not conducive to groundwater storage. It can be seen from the illustration that any water moving into the bedding planes from the catchment area would have little chance to escape from the western slope onto the valley proper. It is more likely that any such water would escape by moving longitudinally toward the canyon which transversely cuts the strata. Several large springs in Logan Canyon, such as De Witt Springs and Ricks Spring, represent this type of movement. Because most of these formations are limestone, any water which finds an escape route tends to remain in the same location by enlarging, through dissolution, the diameter of the pipeline through the calcarous material.

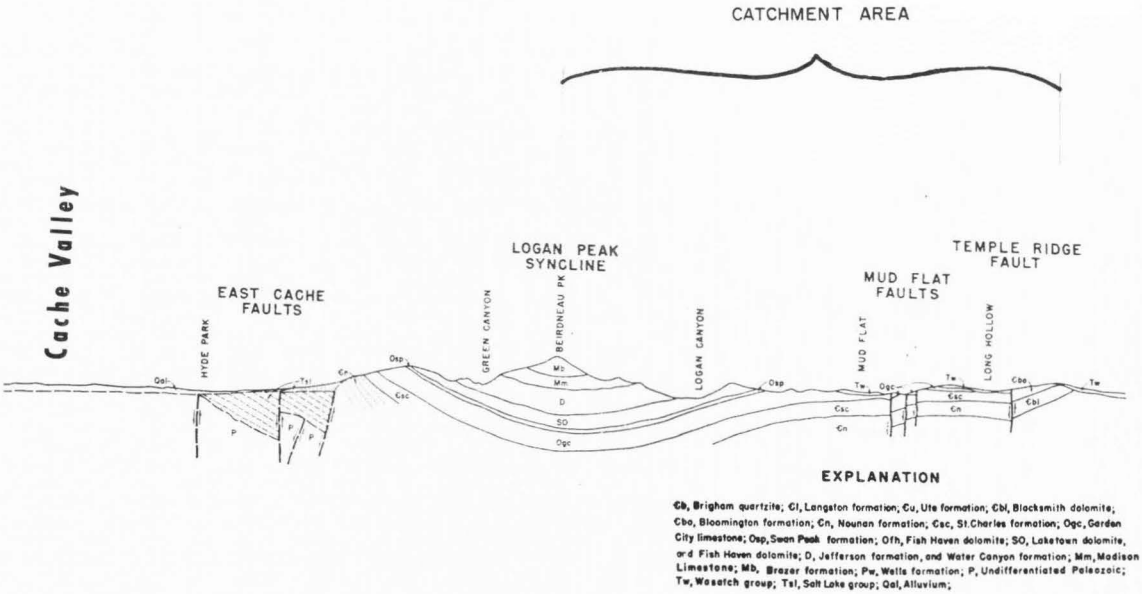

Figure 4. Cross-section through Cache Valley and the mountains eastward which form the Logan River Drainage area.

The mountainous ridge east of Logan River is also an upthrusted fault block similar to the western ridge but does not contain a transverse opening which might allow water to escape from the drainage basin into some other river system. Thus the topographic divide which separates surface drainage into Logan River marks the boundary of a rather tightly closed hydrologic system.

The surface geology map shown in Figure 5 indicates large deposits of Quaternary glacial material near the center of the basin (41). These deposits are relatively absorptive and probably store the bulk of the water that provides the high base flow of Logan River. Some Tertiary deposits which add to the storage reservoir are also shown. The bulk of the seepage water described by Fortier is probably contained in these two deposits.

Because of the lack of absorptive material in the mouth of the canyon and because of the eastward dip of the nonabsorptive basal structure, the river gaging stations in the mouth of the canyon measure the bulk of surface outflow from the drainage basin. It is doubtful if any significant underflow passes the measuring stations.

The valley floor is composed of alluvial deposits laid down by ancient Lake Bonneville. Beneath the lake deposits and resting upon the basal structure is a tertiary sedimentary deposit of volcanic origin, known as the Salt Lake formation. Beneath the valley floor the Salt Lake formation is apparently uncemented and capable of some groundwater

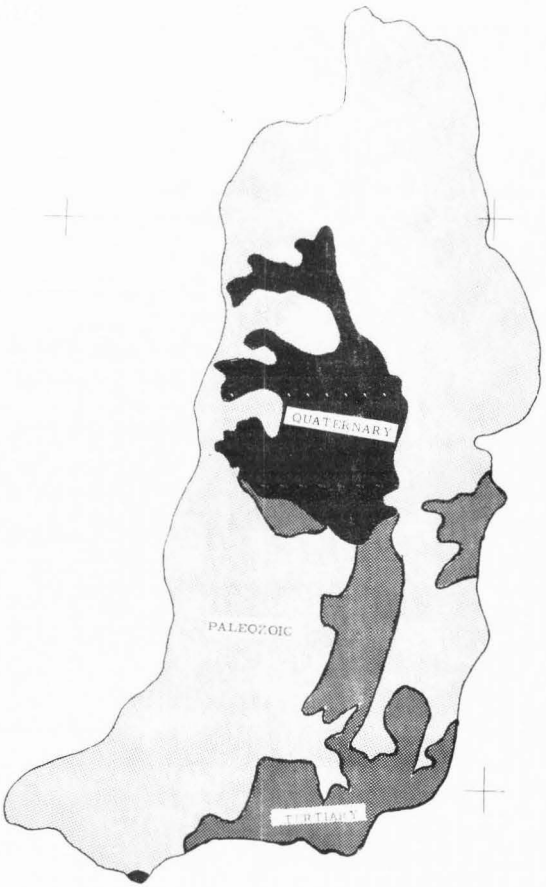

Figure 5. Surface geology map of the Logan River drainage area

storage (1). The valley was formed by fault displacements of several thousand feet on both the east and west sides of the valley, shown in Figure 6. The formation makes a tight basin for the retention of groundwater, recovery of which is limited by the heterogenous placing of gravels and clays from which effective pumping can be accomplished. Over a large part of the valley the tight clays confine water under a natural artesian pressure, which is sufficient to maintain flowing wells.

Climatology

The climate of a region is determined largely by its geographic position, altitude, temperature, and extent of precipitation. None of these variables are independent and the particular combination for any location characterizes the climate. Logan City and Cache Valley lie in a temperate zone with a semi-arid climate. The annual temperature, measured at the Logan USU weather station, is 48.8° F while the average annual precipitation is 16.64 inches. Proceeding easterly across the high Bear River mountains, the climate changes abruptly. The high peaks on the western rim of the basin have an annual precipitation of 50 inches or more. The northern half of the basin has an annual rainfall of 30 inches or more, which exceeds the average annual potential evapotranspiration rate. The climatic factors most affecting water supply and use are precipitation, which determines the total ultimate supply, and temperature, which determines the rate at which water is returned to the atmosphere as vapor.

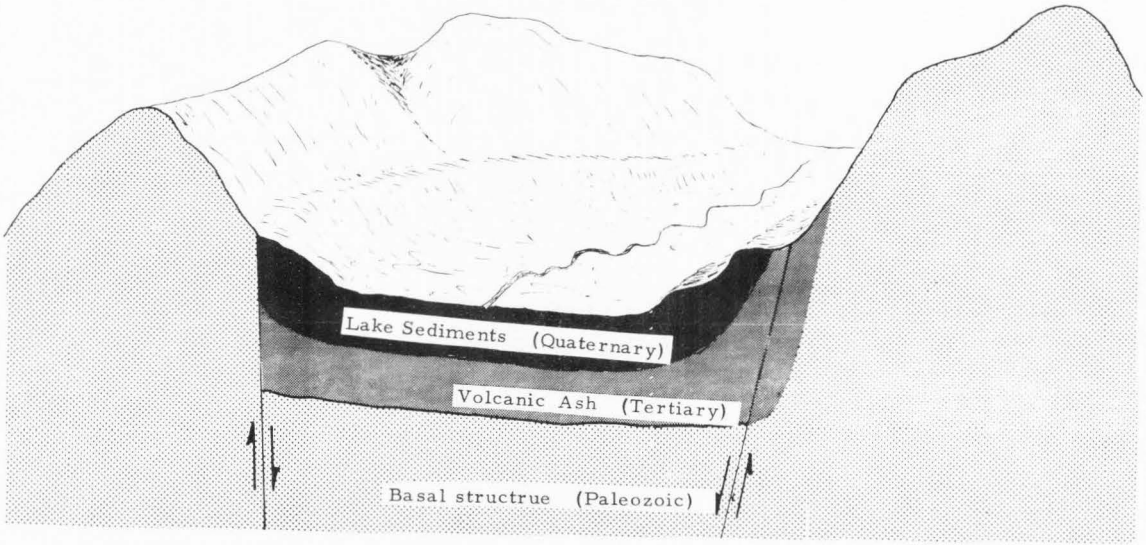

Figure 6. Schematic geologic cross-section of Cache Valley, Utah.

Before the hydrologic processes within a given area can be understood, facts concerning the various climatic parameters must be collected. The task is not easy because the various hydrologic media, such as the atmosphere and the earth's crust, are not homogeneous, isotropic materials. Point measurements of temperature or precipitation do not necessarily represent the average condition from which we can apply deterministic solutions. Precipitation and temperature will vary greatly within a hydrologic study area, and the parameters which define these climatic differences are numerous and difficult to measure and evaluate. A time variation of temperature and precipitation in most cases must wait for time to elapse before the magnitude and periodicity of the variations can be known or understood. The short-time intervals which repeat in true cyclic fashion, such as a day or a year, provide the least difficulty. The problems which are hard to solve are long-time variations for which no true cyclic periods have been identified. Lack of understanding of the basic hydrologic processes such as rainfall, evaporation, the biologic use of water, and groundwater movement also hinders progress. It is difficult to know what parameters should be measured. Finally, the instruments which measure the desired parameters are often inadequate or unobtainable.

The U. S. Weather Bureau was established in 1891 and began the first systematic collection of climatic data in America and at the same time the U. S. Geological Survey was given the responsibility to

measure the surface flow of streams. The meteorologic station at Utah State University was established in 1895 and has maintained a continuous record of temperature and precipitation since that time. The gaging station on Logan River was established in 1896, and a network of snow gaging stations was begun in the Logan River drainage basin in 1924. It was not until 1950 that evaporation was included in the parameters measured in Cache Valley. Additional stations have been added in other parts of Cache County, and additional measurement facilities have been added as the work progressed. The location of all the hydrologic measuring stations within the Logan River area are shown in Figure 7.

Precipitation

Average annual precipitation, as recorded at the USU Weather Station, is 16.64 inches. Only one-third, or 5.54 inches of this precipitation occurs during the five months when temperature and evaporation rates are highest. During the month of July the mean monthly precipitation is only 0.39 inches while average evaporation during that same month is near 8 inches. This time distribution of rainfall is important in characterizing the area and indicates the need for man-made controls to provide water for crops to survive the dry, active, growing period. Average monthly rainfall is shown in Figure 8.

There are no hydrologic stations in the mountains of the catchment area other than the snow gaging stations. It is possible, however,

Figure 7. Location of the hydrologic measuring stations in the Logan River Drainage area.

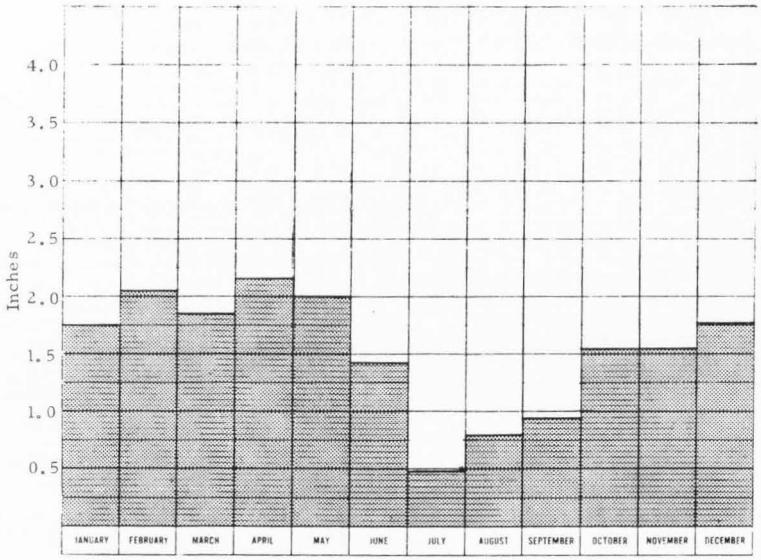

Figure 8. Mean monthly precipitation at Logan (USU), Utah.

to estimate rainfall by correlating measured stations with other hydrological and physiographic characteristics. The U. S. Weather Bureau has done this and has drawn a series of isohyetal lines or lines of equal rainfall on a map of Cache Valley. From this the areal distribution of rainfall can be illustrated and the total precipitation on the watershed can be estimated. Figures 9 and 10 show the isohyetal lines over the Logan River catchment area for both mean annual precipitation and mean precipitation for the growing season, May through September. The total mean annual precipitation on the catchment area above the river gaging station is 376,580 acre feet, or a mean areal distribution of 31.58 inches.

Temperature

The mean annual temperature measured at the USU station is 48.8 degrees. The extremes of temperature on a yearly basis range from near 100° during part of the summer months to near -20° in the coldest winter months. The average daily fluctuation varies about 25°. Temperature is important hydrologically in that it is an indicator of energy received from the sun. This energy is effective in changing water in a solid or liquid form to a vapor phase from which it is free to exit from the hydrologic area. Temperature cannot be related directly to evaporation since evaporation is dependent upon some transport media, such as wind, to remove the saturated air from the

Figure 9. Isohyetal map - mean annual precipitation on Logan River Drainage area (inches).

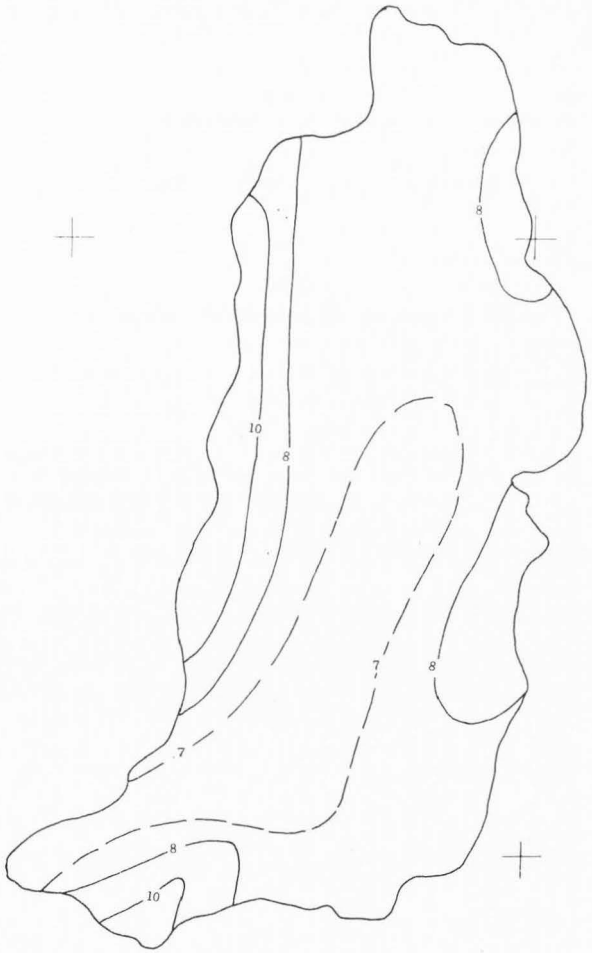

Figure 10. Isohyetal map - mean May to September precipitation on Logan River Drainage area (inches).

water surface. Temperature can be used as an indicator, however, and is often combined with other parameters to form prediction equations for estimating evaporation.

Temperature is important not only to the evaporation process but to the growing process in plants. If the temperature drops to a point at which freezing occurs in the life processes of the plant, no further growth occurs. By studying the historical record of occurrence of freezing temperatures, it is possible to estimate the length of growing season that could be expected in any particular location. A long growing season means a longer period of evaporative cooling needed by the plant and hence a more adequate water supply.

Freezing temperature records for two stations in Cache Valley have been analyzed and the length of the growing season predicted (5). The USU station records a mean annual growing season of 201 days. This station is located on one of the eastern benches near the mouth of the canyon and is probably not representative of the actual growing season in the agricultural area served by Logan River. A shorter season is indicated by observation. Similarly, the station at Lewiston, Utah, probably gives a growing season somewhat shorter than actually experienced. In estimating actual evapotranspiration from the service area of Logan River a compromise between the two stations has been used. Tables 1 and 2 indicate the probable growing season estimated for both stations.

Table 1. Length of growing season (frost-free period) Logan (USU).

Probability Level %	frost free period begins	ends	No. days
90	May 2	Oct. 14	165
75	April 22	Oct. 22	183
50	April 12	Oct. 30	201
25	April 1	Nov. 8	221
10	March 23	Nov. 16	238

Table 2. Length of growing season (frost-free period). Lewiston, Ut.

Probability level %	frost free period begins	ends	No. days
90	May 23	Sept. 11	111
75	May 14	Sept. 19	128
50	May 3	Sept. 27	147
25	Apr. 23	Oct. 5	165
10	Apr. 13	Oct. 13	183

Runoff

The manageable part of any hydrologic system is that part which occurs in liquid form as surface runoff. Groundwater is manageable to a certain extent but requires greater knowledge and skill than surface flow.

Runoff from the Logan River Drainage Basin emerges from the catchment basis in the mouth of a narrow canyon where measurement easily can be accomplished. At the present time continuous records are kept at the four measuring stations on Logan River. Data of fairly good reliability are available for the years from 1896 to the present. The Logan, Hyde Park, and Smithfield canal diverts above the river gaging station and the record of that diversion is not complete for some years. The Utah Power and Light Company diverts water above the gaging station but returns the flow directly to the river after passing it through its generating plant. Logan City diverts water directly into a municipal pipeline, and the flow is not recorded in the published records of the other gaging stations. Since 1961 the flow has been recorded by the Logan River Water Commissioner and is on file in the State Engineer's Office.

The average annual flow of Logan River is 180,300 acre-feet, with extremes varying from a low of 82,000 acre-feet to a high of 366,000 acre-feet. The peak flow occurs in May or June of each year, and the minimum flow during each growing season seldom drops below

100 cfs. As there is no artificial storage on the river, considerable surplus each year flows into Great Salt Lake.

A daily hydrograph is shown in Figure 11. The recession limb maintains a similar slope and shape each year, except as displaced in time by previous supply conditions.

Inasmuch as runoff is considered a stochastic variable, it is often meaningful to analyze long time mean values. The probability of mean monthly flows exceeding certain values is shown in Figure 12.

The results of a statistical analyses which was made by Huber (18) to determine the effect that one year's flow might have upon the succeeding year's flow are shown in Figure 13. Serial correlation techniques were used to plot the curve. The correlation factor is significant at the 90 percent probability level for about 5 years and at the 50 percent probability level the correlation factor is significant for about 16 years. This would indicate that in general there is a lag in precipitation and streamflow--that precipitation that falls this year may still be effective in producing runoff for the succeeding five years. This analysis does not evaluate the amount of storage available or the rate of its depletion, but it does give an indication that there is a storage carryover.

Potential evapotranspiration

In order to manage a money supply it is important to know the rate at which expenditures will be made and the time that payments

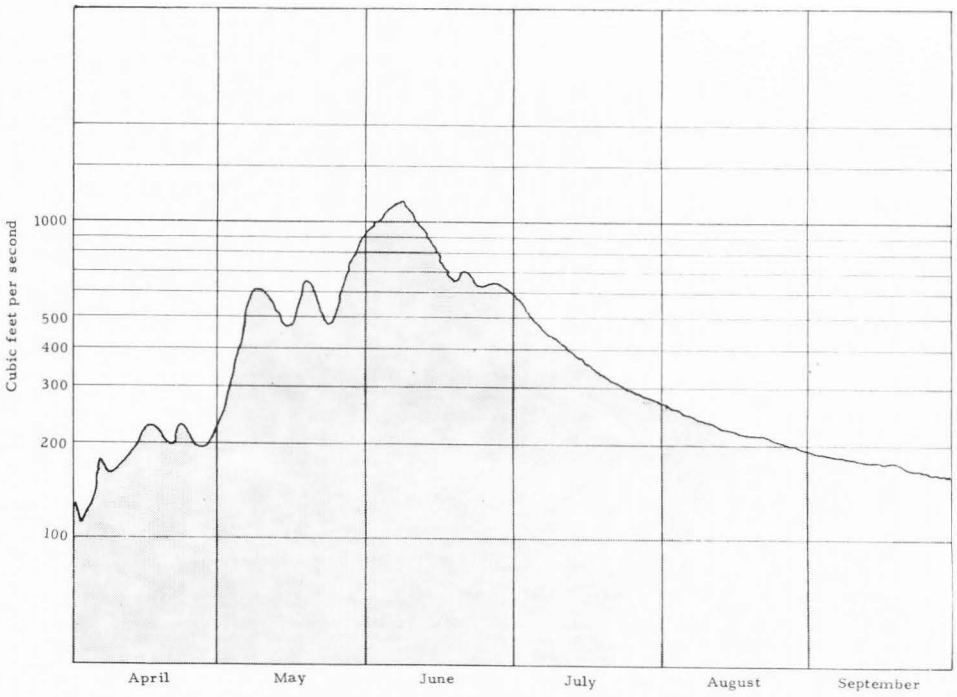

Figure 11. Typical daily hydrograph of Logan River. April through September.

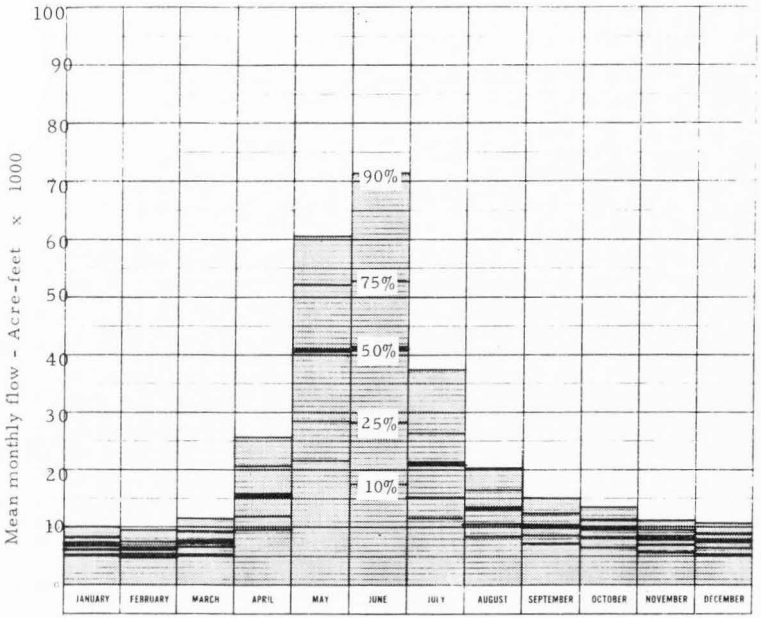

Figure 12. Probable mean monthly flows in Logan River, 1901-1963.

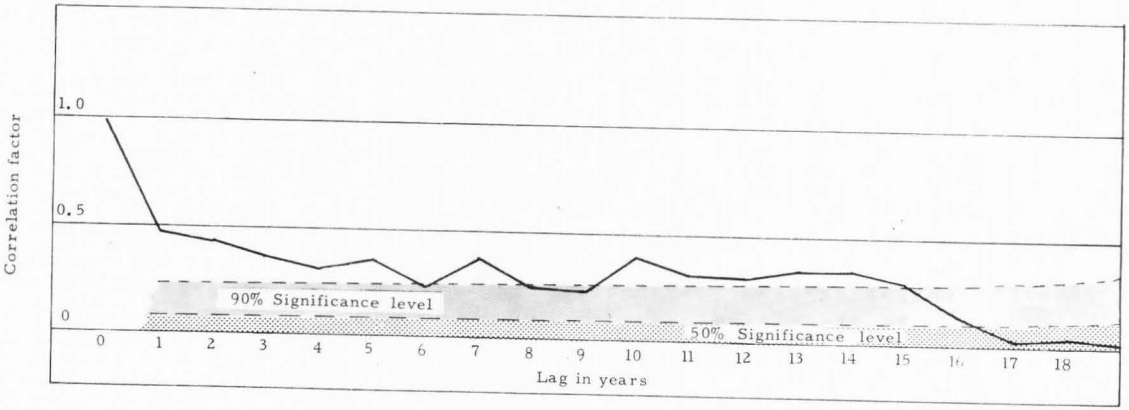

Figure 13. Correlation of Streamflow with preceding years precipitation.

are due. A water budget must similarly be studied, the use by evaporation representing expenditures. Since the bulk of water used is for irrigation, it is important to analyze the irrigation requirements of the crops produced.

Cache Valley is principally a dairying community, and crops raised will reflect the need to produce feed for dairy animals. Alfalfa, hay, pastures, and corn silage are the major crops, while wheat, other small grain, and some canning crops (such as corn, beans, and peas) and sugar beets are the minor crops.

Water use for crops depends upon temperature and length of growing season for each crop. For alfalfa and pasture the growing season is usually terminated by freezing temperatures. Other crops may mature and be harvested before frost has become a limiting factor.

From Ashcroft's study of probable freezing temperatures, a probable growing season has been deduced for the Logan River area by combining the records from the USU weather station with the Lewiston station. The growing season computed from the combined data appears in Table 3.

In order to illustrate the value of having hydrologic information available when water rights are determined, as will be discussed in a later section of this paper, a few assumptions as to crop patterns and acreage will be made. It is not felt pertinent enough to the object of this thesis to make actual measurement, but as use becomes more

Table 3. Length of growing season. (Frost Free Period). Average for Logan River Drainage.

Probability level %	Date season begins	ends	Length days	F[a]
90	May 12	Sept.26	137	28.36
75	May 3	Oct. 5	155	
50	Apr. 22	Oct. 13	175	34.02
25	Apr. 12	Oct. 22	193	
10	Apr. 2	Oct. 30	211	39.48

[a] $F=\frac{pT}{100}$, where p = percentage of daylight hours, T = average monthly temperature, Fahrenheit degrees.

Table 4. Estimated crop distribution

Crop	% of total	Acres	K[b]
orchard	5.6	840	0.70
corn	1.3	195	0.80
peas	1.1	165	0.80
potatoes	0.6	90	0.75
sugar beets	4.8	720	0.70
silage	2.8	420	0.80
hay	52.5	7,875	0.85
small grains	11.7	1,755	0.80
pasture	19.6	2,940	0.80
	100.0	15,000	

[b] K= Blaney - Criddle crop coefficient, determined experimentally.

[c] based on figures from Utah Ag. Stat., a publication of the UAES, June 1963, Utah Resources Series 16.

competitive the details necessary will have to be acquired. The assumptions made will, however, be close enough to actual values to make a valid illustration.

Various estimates as to the amount of land irrigated from Logan River are available. The court decree issued in 1922 required each claimant to declare the amount of land he irrigated. In most cases the values reported were not measured acreages, but estimates based on the number of shares in an irrigation company. The acreage declared for all primary users on Logan River totaled 18,704 acres. In 1946, a study was completed by the Agricultural Experiment Station at Utah State University on the needs of irrigation companies (20). The information was collected by questionnaires; therefore, the reported acreages are again unmeasured estimates. The report of this committee gave a total of 14,810 acres. Several irrigation companies apparently failed to return a questionnaire and were not included in this estimate. The author has estimated the extent of the missing data and corrected the irrigation company survey to get a total of 15,020 acres. For the example used in this study a round figure of 15,000 acres will be used.

The crop pattern for the Logan River irrigation system is assumed to be similar to that of Cache County as a whole. Figures reported in the Utah Agricultural Statistics (4), published in 1963, for the year 1954 are used to represent an average crop distribution. This distribution is shown in Table 4.

Consumptive use rates for the various crops are computed using the Blaney-Criddle method and k values as published in Technical Publication No. 8 by the Utah State Engineer (11). Consumptive use values have been computed for three different probable lengths of growing season: the 50 percent probable season to represent the average condition, and the 10 and 90 percent probable season to represent both extremes of dry and wet years. These daily use curves are represented in Figure 14. This is not a true daily use curve but a curve of average use values for 15 day increments. It is to be noted that there is little variation between curves in the last three months of the growing season, which would seem to indicate that regardless of when planting begins in the spring if shortages of water are to occur they will occur during the months of July, August, and September.

Figure 15 illustrates how critical this period is. It is assumed that one-half of the water diverted for irrigation is lost through seepage and evaporation and that the other one-half is used by the crops. The water required from the river to supply this demand then is represented by the shaded portion of the graph. The unshaded bars represent probable average monthly flows in the river. As shown in the Figure, over 90 percent of the time an adequate water supply will be available during the months of April, May, and June. During July a shortage could be expected about 40 percent of the time and about the beginning of August a shortage can be expected 70 percent of the time. The curve drops off

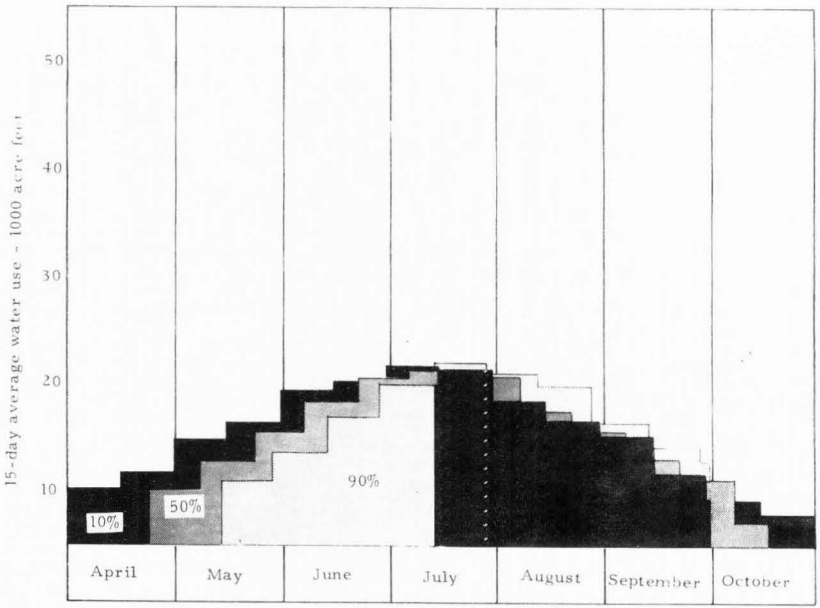

Figure 14. Water requirements for land irrigated from Logan River during normal (50% probability), long (10% probability), and short (90% probability) growing seasons.

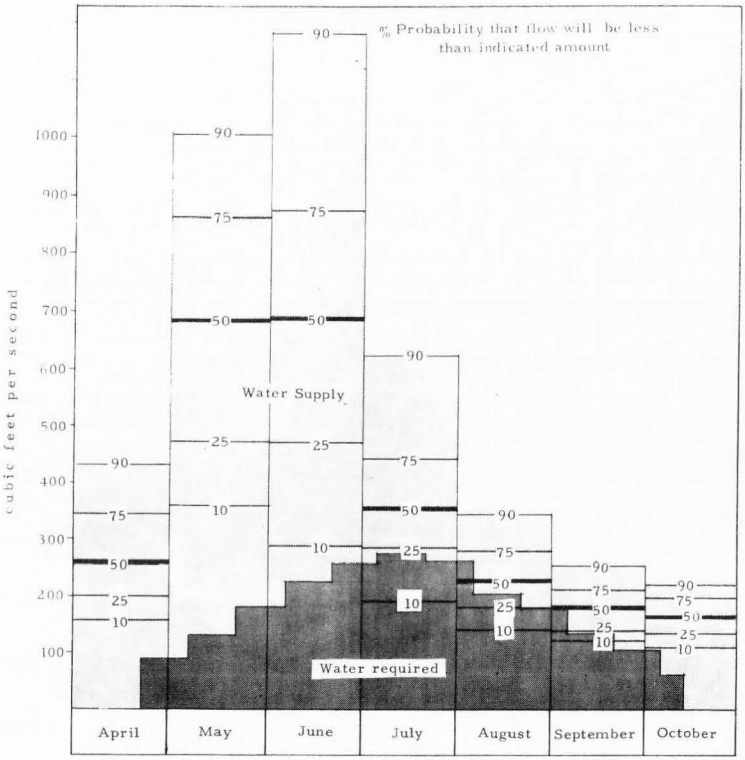

Figure 15. Water requirements versus water supply - average growing season.

as the season advances and by mid-September an adequate supply is assured again. During the critical period when shortages are apt to happen, water right conflicts are most evident.

Water budget

It is impossible to develop a comprehensive water budget that itemizes all of the uses of water. The best that can be done is to determine inflow and outflow rates based on long-time mean values. This gives a picture of what is taking place on the watershed and indicates the annual amount of manageable water. The following budget indicates that a surplus supply of water annually passes by the diversion gates of the Logan River users. If an equal or greater amount flows into Great Salt Lake annually, the surplus could represent unappropriated water. A study of the entire drainage system of Bear River would be required, however, to determine if this is true and how best to utilize this excess.

Table 5. Water budget.

	Inches	acf
Inflow (precipitation)	31.58	376,580
on-site use	16.46	196,280
outflow	15.12	180,300
Diversion for irrigation	5.87	70,000
surplus	9.25	110,300

HISTORICAL BACKGROUND

The waters of Logan River were first put to beneficial use in 1860 when 100 "Mormon" pioneer families "pitched in" to build an irrigation canal. These pioneers were only a small part of the multitude of Mormon pioneers who, at the request of their leader, Brigham Young, were extending Mormon settlements from Mexico to Canada.

The first group of migrants arrived in Salt Lake Valley in July 1847 and hastily erected shelters for the winter. The first years were difficult, and survival in this dry and barren land was uncertain. As methods were discovered to utilize the water from the mountain streams to make the desert produce, the colony gained strength and began to grow.

A church-sponsored financial assistance program made it possible for converts in England, western Europe, and the eastern United States to make the arduous trip to Utah (22). As the number of immigrants increased, the need to find room for them to settle also increased. Opportunities to secure land where the Mormon doctrine could exist without persecution also increased and under the wise direction of Brigham Young, immigrants were organized and sent out from Salt Lake City to establish new communities in the great expanse of unclaimed western land and to build the base for a great unified commonwealth.

The years of 1859 and 1860 were especially prolific in producing new settlements (45). In Cache Valley, where the water supply was plentiful, ten such communities were settled simultaneously. Each community was built near a water course from which irrigation water could be obtained and where water power could be developed to operate feed mills. Probably a thousand families occupied crude shelters in Cache Valley during the winter of 1859-60 (38).

The first families to settle on the Logan River converged on the site in June of 1859. Log cabins were erected to house them, and early in the spring of 1860, construction began on the first canal to use water from Logan River. There was an urgency to get things done. Homes had to be built, grain had to be grown, and energy sources had to be developed to process the grain into food. By the middle of May the first water was turned into the canal (15), and when harvest time arrived a grist mill, using water power from the same canal, was completed. Over 2,000 acres were brought under irrigation that first summer (38). The following year brought more settlers; the digging of more canals; and the establishing of other mills, including a sawmill. By the end of 1865, six canals had been completed and 7,379 acres were being irrigated (38).

When one considers that the type of accomplishment taking place on Logan River was also taking place on dozens of similar water courses at the same time, one begins to realize how well organized and unified

the people must have been. The Mormon Church provided the organization and trained the colonists and assigned them to their particular location. Church rule necessarily preceded civil rule. The transformation to civil government, however, came as quickly as legislative action made it possible.

Of this type of colonization Tullidge (45) says,

> Utah, in its pure Mormon days, was peopled and its cities built up on a strict system of colonization, colonies going out from their parent under a thorough organization, which was perfected in the founding and growth of each settlement; so it became properly regular to enact and administer the laws of a commonwealth through the ecclesiastical organization and methods of the community, previous to the granting of the city charter by the legislature when the civil government proper came into effect.

Even after civil rule was enacted the Church was effective in organizing and directing public projects, including the financing of such works. Tullidge continues,

> in defence of their colonies, in public improvements, the building of school houses, building of bridges, opening of canyons and making of roads, etc., the expense was borne at the private cost of the settlers, by donation, and by the financial administration under the bishop of the wards, rather than out of the public taxes, either of the city or county.

The territorial government of Utah was authorized by the Congress of the United States in 1850 and subsequently on January 6, 1856, the county government for Cache County was organized.

Bishop Peter Maughan led the first group of settlers into Cache Valley in 1856. In 1857 he returned to attend the sessions of the Utah

territorial legislature. At this session he was elected probate judge for Cache County, and three selectmen were chosen to assist him. He appointed a sheriff, a recorder, and a treasurer; and he levied a tax (38). This was done before any permanent settlement had been established.

The Utah war in 1858 caused the temporary evacuation of the few settlers who came with Bishop Maughan (38) but in 1859 and 1860 the settlers returned and new settlers began to arrive in numbers sufficient to create many small communities. Logan was designated the county seat in 1860 (38), probably before a single permanent home had been constructed. In 1865, a corporate charter was issued to Logan City, which by this time had a population approaching 1,500 people (38).

One typical feature of Mormon settlements, such as Logan City, was the layout of the townsite. As soon as possible after entering a new area the townsite was surveyed. Streets were laid out in a grid system of square "blocks," each 8 to 10 acres in size. Each block was divided into "lots," usually 8 per block, which were considered large enough for each family to build a house, raise a vegetable garden, and maintain a limited number of livestock. Large plots of land outside the city limits constituted the "farm" lands on which grain, hay, and pasture were grown to provide the agricultural needs of the community. No homes were constructed on the farm lands.

After the townsite was surveyed, an irrigation system was laid out and each city lot was provided with an irrigation ditch. Prior to incorporation of the community this activity was under the direction of the probate judge of the county, who divided the county into precints, and appointed a water master for each. The water master's duties were to oversee the construction of all irrigation systems and to distribute the water fairly to all users.

In each commuity, there were three areas where water was needed. The first and primary need was to irrigate the crops that were so essential to survival in the new community. Consequently, the farm lands were the first to be irrigated, followed closely by garden plots and city lots. Domestic water was not a serious problem at first as users just dipped from an irrigation ditch or from the river as they needed. Shallow wells provided additional supplies in some parts of the community. As the community grew, however, domestic use was to become a primary use. The third essential use made of water, and in many respects the most important use in the early days of settlement, was the generation of power. Power was needed to grind the wheat into flour and saw the logs into lumber. As the community grew and developed these three uses became separated into user interests, which competed for supply and priority and which eventually resulted in conflict and controversy.

Despite the intensive colonization which took place in Utah, a long time elapsed before statehood was acquired. Controversy over pologamy was successful in preventing statehood until 1896, 46 years after the passage of the organic act. Logan City at this time was a prosperous and progressive community, the largest in Cache Valley.

Logan City was incorporated under the laws of the territory in 1865. From that time until 1912 Logan City was governed by a city council form of government which initially provided for a major, five aldermen, and three councilmen. On March 19, 1890, the position of aldermen was increased from five to seven and each ward represented by one councilman. Two years later, March 19, 1892, the number of wards was reduced to five and two councilmen were elected from each ward. Thus the mayor and ten councilmen evolved as the new governing body (38). On January 1, 1912, a city commission was installed (30).

The growth of the city can be seen from a study of the figures in Table 6.

Table 6. Population of Logan City.

Year	Population
1860	500
1870	1,757
1880	3,200
1890	4,620
1900	5,451
1910	7,522
1920	9,439
1930	9,969
1940	11,875
1950	16,832
1960	18,744

CHANGES IN WATER USE PATTERN

A water right or water "privilege" as it was originally called implies that someone is using water to accomplish some beneficial purpose. In any type of dynamic society with a limited supply of water, the uses to which water is put are continually changing and serious administrative problems are imposed on those charged with the responsibility of distributing water to the various users and at the same time serving the best interests of the community.

When the water supply is ample to meet all needs the administrative problems are not so complex, but there are few places in the arid west where the normal growth in an area will not soon place stresses on the water supply. Water right doctrines and administrative procedures have had to change with changing needs of the water users. It is not to be expected that changes will cease to occur, and in order to meet these changes it is well to understand the historical changes that have brought about the present system. Changes in the Logan River system are typical of most Utah water complexes.

Changes in irrigation use

The initial pattern of irrigation use was simply one of expansion, as the number of canals, number of users, and number of acres irrigated increased. As additional settlers came into the valley it

became necessary to enlarge canals to carry more water or extend them greater lengths to serve additional land. The first canal constructed served, in its first year, about 2,000 acres, but almost before that canal was finished it was being extended to provide water for a grist mill, and as the water passed through the mill it became available to irrigate another 800 acres. The following year this canal was extended north to the Hyde Park settlement to irrigate another 1,700 acres, and small ditches were taken off to the south to irrigate still another 350 acres in the "island" area. By the end of 1861, in just two years time, it is reported that 5,738 7/16 acres were being irrigated (38). This complex of canals, laterals, and mill sites required only one diversion dam across Logan River. This dam, subject to frequent wash-outs until finally stabilized with wooden piles, was later referred to as the "city head gates" (29).

In 1864, the second diversion from the river was started in a somewhat more difficult location. The diversion for this canal, known as the Logan and Richmond Canal, was located upstream from the city head gates near the mouth of the canyon. The original dam diverted the water to the south side of the river and it was then flumed across the river to the north side where it traversed a steep sidehill for about two miles before turning north across the level bench land (2). Since some of the urgency necessary for survival had subsided because crops were now established in the valley, and because established

settlers would not benefit directly from the new canal, the construction of the new canal was somewhat less of a community effort. Under the direction of the county court an irrigation district was formed. The settlers having land under the canal voted to share in the cost of construction, operation, and maintenance by giving the district the power to levi a tax against the property owners. This in a sense made the canal company a public corporation, but the territorial law creating irrigation districts was not passed until 1865 and not exercised by this company until 1872 (9). Under this law the officers of the district were elected through the same procedure that other county officers were, and taxes were collected in the same manner as were property taxes. The Logan Richmond Irrigation District thus formed was effective in building a canal and irrigating 2,000 acres by the end of 1865.

No further expansion of irrigation facilities was necessary until about 1880. At this time the original millrace canal was extended to Benson Ward, and the Logan Richmond Canal was enlarged to accommodate another 1,000 acres. Subsequent enlargements in 1887 and 1890 brought the total area served from Logan River to 10,260 acres.

Just prior to Utah's becoming a state the third and last great irrigation undertaking was completed. By this time the economy in Cache Valley was fairly well established. The frontier urgency was

no longer present, the town was not isolated from the outside world, and signs of prosperity were beginning to appear. The water supply in Logan River was still plentiful, and good fertile land was still available on the higher benchlands east of town. To build a canal to irrigate this land was a much more formidable task than the others had been. This time the canal had to be carved out of the limestone walls on the north side of Logan Canyon. Also, by this time the use of an irrigation district with general taxing authority had little appeal to the somewhat skeptical residents. It was left for a daring few to form a private corporation and raise money through the sale of corporate stock. A few determined men persisted through repeated failures and were finally successful in building a canal that held water. Work was slow because help was available only during the winter months and the canal prism had to be blasted out of the limestone cliffs (36). The task was completed in 1893 and an additional 3,000 acres opened for irrigation (15).

From the completion of the "upper" canal (incorporated as the Logan, Hyde Park, and Smithfield Canal) until the present time (1965) there has been essentially no major increase in irrigation activity. Existing canals have added some additional land but no new diversions have been attempted. An "equilibrium" seems to have been reached in which the land irrigated fits the water supply available.

The type of change that is now going on is the one associated with the change fromthe rural farmer to the urban city dweller. The

city lot which had water supplied to it under the frontier system has now been subdivided into such small parcels that very few people are able or inclined to keep a vegetable garden. This has reduced the land irrigated by the irrigation canal and has increased the demand on the municipal system which is used to sprinkle the lawns and ornamentals that now grace the city lot. The problems apparent in meeting this change are now in need of solution and are a part of the controversy discussed later in this paper.

Changes in water power use

Water power was essential to the success of the pioneering venture in Utah. Logan River, cutting through the terraced benches of old Lake Bonneville, was ideally suited for water power development. The first canal was made to parallel the edge of a low terrace so that water could be dropped 12 to 20 feet over a water wheel back into a small branch of the river. This power potential was sufficient to meet the early pioneer needs.

The first mill, a grist mill, was in operation before the end of 1860 and was followed by numerous other mills which flanked the millstream. By 1876 there were 12 separate mills operating along a half-mile strip of canal. These included grist mills, flour mills, sawmills, a machine shop, a wool carding machine, and a foundary. In addition other mills, principally sawmills, were located on sites on Logan River further upstream and nearer the mouth of the canyon (38).

In 1880 the operators of a planing mill, who were using steam power, sought to improve their condition and eliminate a fire hazard by petitioning the city council for a water privilege. When their petition was granted they installed the first machinery to produce electricity (38). Use of electricity eventually opened up a whole new field of water use. In 1885 Logan City was induced to purchase electric street lights. This permitted the planing mill to use its generator during the night and thus increase its revenue. The city saw a great potential in this enterprise and in 1886 purchased an interest in the generator, and later, in 1888, acquired full ownership. The city operated this direct current plant to light the streets of Logan until the more efficient alternating current generators, installed by the Thatcher Milling and Elevator Company, proved to be the better competitor. The direct current plant was abandoned and a new company formed, using the Thatcher generator. This company, known as the Logan Power, Light, and Heating Company began operating in 1890 and was without competition until the formation of the Hercules Power Company in 1894. Hercules acquired, in 1897, the privilege of constructing a plant in the mouth of Logan Canyon. The additional water and higher head gave Hercules a distinct advantage over the millrace producers, and in 1900 Hercules was able to purchase the mill rights and become sole producer. An "outside" corporation, the Logan Power Company, purchased the Hercules interest in 1901, constructed a much larger plant, and installed transmission lines to

the mining fields in Colorado. The enterprise was then sold to the Telluride Power Company in 1903 and became part of the Utah Power and Light System in 1912 (12).

Logan City was not satisfied with the service and the cost of power furnished them by the Logan Power Company (38). Perhaps there was also a tinge of resentment against the "outside" firm. In any event, in 1901 Logan City posted notice, in accordance with the new water law, and began construction of its own power plant in Logan Canyon at the site of an early sawmill. Utah State Agricultural College followed this trend and acquired in 1914 its own site on the river on which it could also build a power plant (38).

It soon became evident that the smaller millrace plants could not compete with the larger plants and they were gradually abandoned until today only one mill remains.[1]

Power generation on the millstream was a significant contributor to the economy of Cache Valley, but as power demands increased, other sources had to be located. The main river plants were built, but they too have long been inadequate to meet the ever increasing power requirements. A large dam on the Green River in Eastern Utah is now supplying part of the power needs of Logan City, and perhaps tomorrow

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[1] The only mill still using water power from the original millrace canal is Central Milling Company located near center and first east streets in Logan.

will see atomic power plants replacing even this source. Water power from Logan River, once highly important, may someday vanish completely.

Changes in municipal use

Until the construction of a municipal water system in 1879, the residents of Logan obtained drinking water from canals or shallow wells. The first suggestion that the city could alter this situation was made in a city council meeting in January 1878 by councilman C. O. Card. In the February meeting, Alderman M. Thatcher

> moved that the committee on public works proceed at its earliest convenience to make a preliminary survey for the location of a waterworks on the bench east of the public square, running a pipe thence west down Third Street to Washington Street and another branch from the Co-op Corner south to Second Street . . . . (29)

In April 1879, the mayor was authorized by the City Council to borrow $8,000 to begin construction of the waterworks. As nearly as can be determined, the first pipeline started near the intersection of the present Fourth North Street and Sixth East Street and took water from the Logan and Richmond Canal. A 10-inch pipeline conveyed the water to a reservoir located where the residence at 193 N. 4th E. now stands, one block east of the Logan LDS Temple (29). The main service line then probably ran west along Second North (from which a 2-inch line supplied the Temple) to Main Street. Even before the first line was complete, extensions were authorized for an additional $3,000 (38).

It is interesting to note that the works were completed before Logan City had any right to use the water. By this time the city's jurisdiction over water development had ceased. It could only obtain water by complying with the requirements of the Irrigation District. In July 1880, the Logan and Richmond Irrigation District agreed to sell to Logan City, "90 cu. in. of water" (or what could flow through an opening 6 x 15 inches) provided that the city "pay an annual tax . . . equal to the amount paid by each 70 acres of land in said irrigation district" (29).

The completed municipal system must have seemed like a great improvement although not all homes were connected (the business houses were the first to use the system). The system was not without problems, however. One of the first inconveniences encountered was the inability to keep water in the pipelines during the winter months, when the canal was normally empty or frozen (29).

When the upper canal first began selling stock Logan City was among the first to subscribe. Before water was turned into the canal, Logan City had acquired 500 shares in the new canal. This later proved to be a valuable investment by the city.

A plan to improve the water system was proposed in 1892, and a competent engineer, Mr. Samuel Fortier, was employed. He advised the abandonment of the old source of supply and recommended that the future source of supply be the new canal of the Logan, Hyde Park and Smithfield Irrigation Company. The plan was accepted and the new

system was completed in 1893. The old system was not entirely abandoned as it was used to supply the island area (29).

One of the first acts of the Board of Commissioners, upon taking office in 1912, was to appoint Engineer T. H. Humphreys to study the waterworks and make recommendations. Mr. Humphreys made two suggestions: first, that the intake into Logan City's pipeline be measured, and second, that the source of supply be moved from the canal to DeWitt Springs in Logan Canyon (29). The city was not sure that it was getting all the water it was entitled to, and if this source was continued, a filtering system would be necessary and the flow rate would have to be known for design purposes.

Apparently the measuring device was too costly as it was never installed; but the advice to move into the canyon was seriously considered and eventually accomplished. The City was permitted to surrender its 512 shares in the Canal Company for an equal amount of water from the spring. The flow was to fluctuate with the flow in the river and be subject to measurement by the Canal Company. The one indefinite part of this arrangement was the amount of water to which the City was entitled. According to the agreement, the City was entitled to divert 512/2489 of the Canal Company's portion (29). The Canal Company's interest in the river was not definitely determined but was, by agreement, set at a maximum of 47.81 cfs. This figure was arrived at by a study group appointed in 1902 by the water users

who issued a report known as the "Barber-Swendsen Report" (6). Much of this report was later incorporated into a court decree, but at the time the transfer was made there was no decree. The City's portion, according to the agreement, would amount to a maximum of 9.8 cfs. This figure was rounded to 10-second-feet, which was eventually decreed to the City. In the Barber-Swendsen Report the Canal Company had a Class 9 right, which meant that in the event the river got as low as 120 cfs there would be no water available for Logan City or the canal.

The improvements made in 1914 and 1915 included the laying of wood staved pipe from the spring to a reservoir immediately east of the canal above the present Golf and Country Club. This pipe served well, and was finally replaced in 1947 and 1949 with steel and concrete pipe. The new pipeline gave the system an increased capacity but the City overlooked the need to increase its right to the water.

The growth of the City's municipal water need can be partially seen by noting the increase in population and water connections over the years, Table 7. The use of water is not, however, fully reflected because in recent years new connectors have meant not only domestic water but sprinkler water for lawns as well.

Table 7. Number of Water Accounts in Logan City
Period from 1921 to Nov. 27, 1961

Year	Number	% Increase	Year	Number	% Increase
1921	1732		1942	3112	7
1922	1823	91	1943	3150	38
1923	1893	70	1944	3157	7
1924	1955	62	1945	3165	8
1925	2023	68	1946	3255	90
1926	2161	138	1947	3446	191
1927	2271	110	1948	3575	129
1928	2385	114	1949	3693	118
1929	2448	63	1950	3775	82
1930	2511	63	1951	3879	104
1931	2552	41	1952	3919	40
1932	2565	13	1953	3986	67
1933	2572	7	1954	4079	93
1934	2610	38	1955	4168	89
1935	2675	65	1956	4238	70
1936	2748	73	1957	4279	41
1937	2798	50	1958	4370	91
1938	2859	61	1959	4510	140
1939	2957	98	1960	4614	104
1940	3052	95	1961 to 11-27-61	4726	112
1941	3105	53			

WATER RIGHT ADMINISTRATION

The methods used by political bodies to distribute and manage natural resources determine , to a large extent, how fast and how well resources are exploited to best serve human welfare. The methods developed by the Mormon pioneers in settling the arid Utah regions were particularly useful in maintaining order and at the same time stimulating development. One of the most significant contributions of this society was the appropriation doctrine of acquiring rights to resource development. Without the development of the appropriation doctrine of water rights, the barren desert would be barren still. There was no place for riparian proprietorship in water-short areas like Utah.

The philosophy behind the appropriation doctrine is that water is a public resource and every use of water is a public use. No one individual or group of individuals can "own" the water and exploit its use to their private gain. To be able to use water is a "privilege" granted only as long as the water is used beneficially. Any failure to comply with this requirement may result in the privilege being taken away and given to another. As long as compliance with this requirement is met, no one can deprive the appropriator of his right. Rights can only be "taken" by exercising the power of eminent domain and properly compensating the appropriator for his loss. The laws that

now uphold and protect the doctrine of appropriation have evolved through the furnace of experience; and the methods now used to administer the laws have similarly evolved.

The evolution of administrative procedure relating to water laws in Utah began with the very broad powers given the county court and gradually moved into the supervisory and protective control of the State Engineer. Between lies the period of definition when laws and procedures were being tested and proven.

Water resource control by the county court

The United States Congress passed an act in 1850 permitting the organization of the Utah Territory. Under the judiciary powers granted the Territory, the counties were in turn granted broad powers, especially with respect to natural resources. The Territorial Judicial Act states,

> The county court has the control of all timber, water privileges, or any water course or creek, to grant millsites, and exercise such powers as in their judgement shall best preserve the timber and subserve the interest of the settlements, in the distribution of water for irrigation or other purposes. All grants or rights held under the legislative authority, shall not be interfered with. (9)

It was under this type of authority that Cache County was governed and the minutes of the county court bear evidence of the procedure used. For instance on December 3, 1862, "a petition of E. T. Benson and Peter Maughan praying for a grant to control all the water, timber, wood, minerals and grass in Logan Canyon, subject

to the direction of the court, was presented and granted." (9)

Since the two men mentioned in the petition were the ecclesiastical leaders of the people it is inferred that they were holding the resources for the organized development by the community and not as a selfish scheme to enrich themselves. This may also account for the fact that much of the money going into the development of natural resources came from private sources and not from taxes.

Another request for use of a natural resource is of interest because it more nearly represents the method by which these resources were managed.

> A petition of Richard P. Livingston, praying for a water privilege in Logan, for a carding machine, turning lathe, or other machinery was presented and granted with the following proviso: petitioner be allowed one square foot of water, paying $100.00 in labor upon the public water ditch the first year, and $150.00 in labor upon the public ditch the following year. (9)

Not all petitions were granted without protest as is evidenced by this entry for March 5, 1866,

> a petition was filed by Geo. W. Thurston, of Mendon, to solicit the privilege of erecting a grist mill at or near what is known as the Wellsville North Field Spring, the Clayton Spring, and the Mendon or Gardener's Spring--together with land enough for a millsite and mill race, etc.
>
> A remonstrance was put in by the company who erected the dam at the North Field Spring and a lengthy discussion ensued. When it was suggested by the court that it would be well if the parties could come to an amiable decision, and in order to afford time for that purpose, the court adjourned for one hour.
>
> On the court reassembling, no decision had been arrived at, the court finally decided as follows:

> Be it enacted by the court that Alvin Crockett of Logan, James G. Willie of Mendon, and Bishop William Maughan of Wellsville, be constituted a committee to consider what amount George Thurston shall pay in order to compensate the parties who erected the dam at North Field Spring, he being allowed the privilege to build a grist mill at or near to that dam. (9)

Besides granting the privilege to use water, the court also had jurisdiction and responsibility to see that the privileges were not abused and that fair distribution of water supplies was made. To accomplish this, watermasters were appointed by the court for each of the precincts within the county. David B. Dille, appointed June 4, 1860, was the first watermaster for the Logan Precinct (9). Mr. Thomas Talbot was appointed watermaster in March 1861 and served consecutively until 1870 (9). Logan City was incorporated in 1865, and, in 1871, began to supervise its own water resources in a manner similar to that practiced by the county court. The county court did not appoint a watermaster for the Logan Precinct in 1871; but the Logan City Council, for the first time, did appoint a watermaster. The first watermaster under the City charter was William B. Preston, who was appointed with the instruction to "regulate water and enforce the ordinances thereto" (29).

The laws of the county permitted the organization of irrigation companies, prior to enactment of the Territorial Legislation in 1865 to incorporate canal companies as public corporations. The court apparently controlled the irrigation companies prior to their incorporation, by appointing its officers, as evidenced by this

statement recorded February 5, 1866, "Be it ordered by the court that Alvin Crockett be appointed to take the place of Thomas E. Ricks as director of the Logan and Richmond Canal" (9). The Canal Company also had the right to tax the property owners served in order to finance the Company.

An act passed January 20, 1865, by the Territorial Legislature made it possible for irrigation companies to become public corporations, and officers for the company would appear on the regular ballot along with other elected city and county officials. The entry for April 1, 1873, says,

> W. B. Preston (moved) that an election be appointed by this court in accordance with the act incorporating irrigation companies approved January 20, 1865 . . . . court ordered election on Saturday, March 12, 1873, at 7 p.m., in Logan Hall. (29)

The Logan-Richmond Canal was incorporated in this manner, but the other canal remained unorganized.

Powers of the city council

Upon incorporation the City received much the same power over water resources within the City that the County had for the County. For instance, on August 1, 1869, a petition was filed by N. E. Pedersen "for grant of millsite and water privilege in Block 1, Plot A, Logan City Survey--for hulling barley, and for making oatmeal."

The petition was granted on the condition that: "petitioner shall enlarge the ditch." It was further stated that the "owners of the

Hyde, Ricks and Company gristmill and carding machine . . . have not enlarged the canal, having heretofore used water belonging to city lots and farming land." It was then moved and carried that "any future development shall enlarge the canal . . . under the supervision of the city council . . . ." (29)

In January 1876 the U. O. Foundry and Machine and Iron Works petitioned "to enlarge the canal [so that] 1400 cfm [could be diverted] to operate a 25 hp turbine. Petition granted." (29)

An incorporated irrigation company was apparently not subject to the powers of the City Council because when in 1879, Logan City needed water for its municipal supply, the City became the petitioner to "the Logan and Richmond Canal Company for a perpetual water right" (29). The original canal system which irrigated City lots and farm lands, and provided power for millsites was probably not incorporated because of its complex nature. For this reason the system remained under control of the City Council while other canals within the City were independent agencies. (To date, 1965, the transition of control to the irrigation companies has not been completed because the title to the land occupied by the canals is still held by the City.)

Regulating the flow of water and proportioning the supply to the various users rested (as it did under court control) with a watermaster. As has been mentioned, the first watermaster to be appointed by the City was William B. Preston. The importance of this position can be

realized when it is noted that Mr. Preston was one of the most influential men in Cache Valley, having served as Mayor of Logan City and a bishop in the LDS Church in the Logan area. In 1875 Thomas X. Smith, another influential leader in the community, was appointed watermaster and served for several years. During these early years of development sound leadership was considered important. Later the job of watermaster became more routine and eventually was discontinued.

Administrative control by city council begins to wane

Because the minutes of the City Council and the county court are silent on the subject of water disputes, it is assumed that when disputes existed they were settled by the ecclesiastical court. However, Logan River furnished an ample supply of water for all existing users, and disputes may have been few. Even at the time of statehood the Attorney General reported to the Governor that only two cases had been tried in Cache County for "stealing" water. Water quality was apparently very important, however, because nine cases were tried for "befouling" waters (8).

The complex of mills, city lots, and farms sharing water from one canal without an organized body to govern it was a natural source of difficulty. So long as capable leadership was directing the activity, however, there were few problems that could not be resolved. When the first watermasters, who were men of considerable experience and

leadership were replaced by men of less ability or with other primary interests, problems increased in number and complexity.

An unbalanced situation with inherent elements of a potential legal conflict existed in Logan City. The two canal systems operating in Logan, the Logan-Hyde Park-Benson-Millrace Complex and the Logan-Richmond Irrigation District, were administered under two different methods. The Millrace complex was not incorporated and was therefore administered by the City Council, a practice stemming from the very beginning of the settlement. To supervise operation, maintenance, and distribution, the City appointed a watermaster. The Logan-Richmond Canal was a public corporation and as such had its own officers and appointed its own watermaster. The residents owning land under the canal were taxed to pay for the operation and maintenance costs. It is presumed that prior to 1873 these land owners also paid general taxes to Logan City, which may have paid for some of the expenses on the other canal and for the city watermaster.

In the early period the Millrace Complex had frequent trouble with canal breaks and dam washouts. Repairs were usually made under the direction of the city watermaster and costs paid out of the city treasury. Occasionally, the mill owners made repairs themselves without cost to the City. This matter was discussed in council meeting in 1873 and decided by the council to "tax all land and machinery owners for repairs on the ditches." Subsequently, a levy of 1 1/4 mills

was placed upon all land (29) including land under the Logan-Richmond Canal and the Logan, Hyde Park and Smithfield Canal when it was organized, and all machinery owners. This "double tax" for the two upper canals was clearly an area for dispute.

The conflict existed for approximately twenty years and was not fully resolved until about 1912. Through the years different plans were proposed, but none was accepted as entirely satisfactory. The situation was described in 1886 by the Committee on Irrigation as follows:

> There are four canals within the limits of Logan City, the two upper and two lower. All of the land under and irrigated by the waters from these canals has a water tax levied upon it at the rate of 1 1/4 mills by Logan City. The two upper canals are organized and each has its own officers, among them watermasters who are paid for their services by a special tax made by themselves. The two lower canals have no organization of any kind.
>
> We would recommend therefore that no salaries be paid from the treasury of Logan City to sub-watermasters, but would suggest that they receive their pay as they have done for the past 20 years, viz. from the farmers.
>
> We would further recommend that the present ordinances regarding the (city) corporation controlling all streams running through the city limits be repealed, thereby placing the responsibility and care of all canals immediately upon the farmers and mill owners and owners of city lots. (29)

Five years later, in June 1891, another plan was submitted, this time by Mr. Thomas Irvine, acting for the farmers under the Millrace Canal. Since the first proposal the farmers had organized informally as the "Logan Irrigation District." Mr. Irvine suggested that the costs of the canal (Millrace Canal only) be shared as follows:

Logan City	1/2
Mill owners	1/4
Logan Irrigation District	1/4

"and that the city pay the water tax on all city lots under the two upper canal" (29). Adoption of the proposal would relieve city lot owners of the double tax. Neither of the proposed tax plans was ever accepted.

As mentioned before, the watermaster was a key figure in this complex water problem. A situation was created, however, which diverted the attention of the watermaster to problems of a different nature. In 1879 Logan constructed a municipal waterworks. During the next several years the system expanded rapidly and needed the constant attention of a qualified supervisor. The most logical man for this job was the city watermaster. In 1889 this key figure had the double title of watermaster and superintendent of waterworks (29).

One year later the watermaster or superintendent (whichever he regarded himself) wanted to know the bounds of his authority and so asked the City to define the City's right in the canals. Instead, the City Council redefined the duties of the watermaster (29).

In 1891, either because the watermaster was not doing his job well, or because he was doing it too well, a group of 170 irate citizens petitioned the City Council to have the watermaster removed from office (29). Although he was not removed, his control over the canal

companies essentially ended. The next year (1892) a committee of three was appointed to "control the irrigation ditches." The committee was composed of one member from each of the three interested groups; viz. the mill owners, the farmers, and the City lot owners (actually the City Council). The committee determined that each group was to pay one-third of the cost of running the canal. This committee had jurisdiction only over the Millrace Complex but not over the two upper canals (29). It was not to be expected that these two upper canals would like this arrangement and it was not long before they were petitioning the City to pay one-third of their costs (29).

Logan City was still paying one-third of the costs of the lower canal in 1897, as evidenced by the questioning of one member of the City Council (29). A study of the situation revealed that the new law under statehood gave the City Council power to "control all water and water courses." That the Council was not "controlling" all water courses, but just subsidizing one, was evidence in 1895 when the Council received a petition for "permission to use the canal." The City refused to accept the petition on the grounds that the City "had no power to grant such privileges." (29).

Over the years a gradual transition had taken place which completely reversed the position of the City Council. When once the City had virtually complete control, by the turn of the century it "had no power." The separation from administrative control widened until by

1909 the City even refused to help repair a leak in the river bank. It was obvious that the City no longer wanted the "power to control." It is presumed that with the change to a Board of Commissioners in 1912 all control, including cost sharing had ended. The City statutes in 1927 clearly indicated that the owner of the ditch was responsible (28).

Control shifted to county selectmen

So far the transfer of water right administration has been traced from the probate judge to the City, and the City gradually ceased to be an administrative power in this area. Outside the Logan City the probate judge still exercised complete control until a new territorial law was passed in 1880. The new law was an attempt to define the rights presently existing by placing on record in the county offices the names of all persons owning water privileges. A method was also proposed to acquire a new water privilege. Up until this time the probate judge awarded water privileges based upon his own judgment and appraisal of the petitioner. There was no established criteria to influence his decision and the petitioner had no recourse to a higher court. The success of this method was dependent upon good leadership in the probate court and upon the faith of the settlers to abide by the courts decision. No serious problems arose as long as the settlers were unified through membership in the Mormon Church, but with increased population and contact with "gentiles" the discriminatory powers of the probate court had to be changed.

The revised statutes of 1880 provided the first legal step toward the appropriation doctrine that later became the law of the land. This step formed a natural transition from the probate court to the State Engineer. The act stated that

> the selectmen of the several counties of this territory are hereby created ex-officio water commissioners for their respective counties, whose power and duties shall be to make, or cause to be made and recorded, such observations, from time to time, as they may deem necessary, of the quantity and flow of water in the natural sources of supply and to determine, as near as may be, the average flow thereof at any season of the year, and to receive, hear, and determine all claims to the use of water, and on the receipt of satisfactory proof of any right to the use of water having vested, to issue to the person owning such a right a certificate thereof for recording, and to generally oversee, in person or by agents appointed by them, the distribution of water within their respective countries, from natural sources of supply, to all the corporations, or persons, having joint rights in and to any natural sources of supply, and to fairly distribute, according to law, to each of said corporations, or persons, their several portions of such water; and in case of dispute . . . to hear and decide . . . (24)

It is interesting to note here that upon passage of the law the City Council asked the Committee on Irrigation to make a report on the new law and express an opinion as to whether the City should file a claim for water with the county commissioners. The opinion was that "Logan City had already primary and vested rights to all the water supply necessary" (29). Nine years later the mayor was urging the council to secure additional water to operate the City waterworks.

There is no recorded instance when the selectmen were called upon to "hear and decide" any disputes within Logan City. Fortier

indicated that they were operating outside the City, however. For example, the users of water from High Creek near Richmond, Utah, were disputing over the division of water to the various users. The selectmen were called in, and rendered a decision. In this case the decision was unacceptable so the selectmen called in the board of arbitration to finally resolve and settle the problem (19).

There are on file in the county recorder's office numerous claims for water use and copies of certificates issued by the county selectmen. Unfortunately, the law did not provide for anyone to examine the claims as they appeared on the ground. All recorded statements are therefore, not necessarily true as water users are sometimes prone to exaggerate their needs.

Changes in control accompany statehood

In his message to the Second Session of the newly formed Utah State Legislature, Governor Heber M. Wells asked the legislators to consider a new code relating to irrigation and water rights. He said: "The ever increasing amount of litigation in our courts over water rights is sufficient proof of the need for good laws to replace our insufficient and antiquated provisions on that subject" (48). The new code proposed by the Governor called for the preservation of the rights of original appropriators, a uniform system of measuring water, the filing and recording of rights already acquired or that may be hereafter acquired through appropriation and use of water, rights-of-way over

state lands and for the condemnation of private lands for the construction of canals, reservoirs, etc., and the adoption of the California "Wright" irrigation district law (48).

Not a part of the section on irrigation, but in a section of its own was a law creating the office of the State Engineer. His duties were primarily to inspect and enforce safety regulations with respect to the construction of dams. In addition he was to

> keep a record of all measurements of streams and other valuable information in relation to irrigation matters of the state that may come to his knowledge, . . . and to give information desired by any person as to the proper method of measuring water or of constructing an apparatus for such measurement . . . and shall give special instructions to all watermasters as to measurements of water, so as to secure a just distribution of the same. (25)

The water right law enacted by the Second Legislature contained the following points:

1. "The rights to the use of . . . waters of the State may be acquired by appropriation." This is the first mention of the appropriation doctrine in a legislative document, although the Territorial Supreme Court had set the precedent in the case of Stowell vs. Johnson. The majority opinion stated that:

> Riparian rights have never been recognized in this territory, or in any state or territory where irrigation is necessary; for the appropriation of water for the purpose of irrigation is entirely and unavoidably in conflict with the common law doctrine of riparian proprietorship. If that had been recognized and applied in this territory, it would still be a desert. The legislature of this territory has always ignored this claim of riparian proprietorship, and the practice and usages of the inhabitants have never considered it applicable, and have never regarded it. (47)

In Utah water has always been considered a public resource.

2. "The appropriation must be for some useful purpose, and when the appropriator . . . ceases to use the waters for a period of seven years the right ceases."

The method outlined for acquiring a new right as provided by the new code was as follows:

"A notice in writing (is posted) in two conspicuous places, one copy at the nearest post office . . . and one copy at the point of intended diversion . . ." (26). This method was aparently borrowed from the mining industry's practice of filing claim to a fixed mineral resource, and was not too successful when applied to flowing water. The notice was to state the amount of water (in cubic feet per second), the purpose for which it was intended, the means of diversion, and the name of the appropriator and the date of the appropriation. The appropriator then had 20 days to verify his posting by filing his notice in the county recorders office and 40 days to begin construction. Failure to comply meant failure to acquire a right as against a subsequent appropriator. It should be obvious to the engineer that this method gives no opportunity to investigate the possible infringement the new right may have against prior appropriators. There was also no provision for a responsible field inspection and measurement to see that the claims were not exaggerated.

In 1901, the legislature repealed the 1897 law, which provided for the appointment of the State Engineer and enacted a new chapter which

essentially included all of the provisions of the old statute and additional sections which authorized the county commissioners to appoint water commissioners to distribute water from natural streams under the supervision of the State Engineer. The law provided for payment of salaries and expenses of the water commissioners out of the general fund of the county. The appointment of water commissioners by the county continued with some exceptions until 1919 when the present system of state-appointed water commissioners was enacted.

The State Engineer given authority

The first comprehensive water law was enacted in 1903. This law placed all water administration in the office of the State Engineer and initiated a new method or procedure for acquiring new water rights. The new procedure, which is essentially the procedure used today (1966), provided for the filing of an application with the State Engineer, the publication of a notice to water users, the filing of protests, approval or rejection by the State Engineer, the right of appeal to the courts, the submission of proof of appropriation, and the issuance of a certificate. This method has been effective for over 60 years, and although not perfect, it appears to be a sound and reasonable method of initiating water rights. The State Engineer has a chance to evaluate the application in terms of all other users and to decide if unappropriated water exists. After his decision is rendered, the applicant still has recourse to the courts if he thinks the engineer has made a bad decision.

In this first enactment giving the engineer the responsibility for administering water rights the State Engineer was directed to make a hydrographic survey of each river stream and water course in the State, to file a report and statement of rights with the district court, and to cause notices to be published requiring individual water users to file statements of their claims. Such statements were equivalent to pleadings, and the district court was authorized to hear contests and make decrees (46). Unfortunately, few of the early decrees used this method. The hydrographic survey of Logan River was completed and filed with the court in 1911 (42) and claims were received (43), but apparently no hearings before the referee were ever conducted. The statute provided that the referee was to make findings of fact and report to the court as a basis for the decree. This method was changed in 1919 making the State Engineer the referee who was to prepare the findings of fact and make a report to the court in the form of a proposed determination.

Essentials of the present water law

Water rights in the State of Utah are based entirely on the doctrine of appropriation. The salient features of this doctrine are:

1. Water in its natural source is the property of the public and is not subject to private ownership.
2. Rights to its use may be acquired only by appropriation and beneficial use.

3. The first in time is the first in right.

4. Beneficial use shall be the basis, the measure, and the limit of the right.

The State Engineer is the administrative official responsible to see that water rights are preserved and protected according to the law; and it is to him that all applications must be made to initiate new rights. In case of dispute the engineer investigates and prepares proposed determinations of rights, which he submits to the court. The court hears all arguments and makes a final decree. It is then the responsibility of the engineer to enforce the decree, appointing commissioners if necessary to make water deliveries and make a permanent record of water uses.

Since beneficial use is the measure of this right any cessation of use for a statutory period of five years (26) constitutes abandonment and loss of the right.

All water, including groundwater is covered by the law, and a new right can only be initiated in one way. A right cannot be acquired by adverse possession or use (27).

CONTROVERSY

Barber-Swendsen report

The administration of water rights on Logan River has been remarkably peaceful over the years. There are probably several reasons for this. In the first place, Logan River has not been overly developed. With plenty of water to satisfy the users there has been little reason for dispute, but as the community grew and uses increased there was bound to come a time when the uses would begin to exceed the supply and a conflict would arise. Fortunately, the Logan River water users were guided through this period by some wise and capable engineers who knew how to measure water and who made a competent and thorough study to ascertain facts.

It has been mentioned that Fortier made measurements on Logan River and on various canals in the area beginning in 1893. Fortier was aware that conflicts could and would arise and that the best defense was competent measurement. His successor, G. L. Swendsen, was equally aware of the problems and, in 1899, continued the work Fortier had begun.

It is difficult, being separated in time by 65 years, to determine if the two engineers, Fortier and Swendsen, were responsible for making the water users aware of their problems, or whether the water users approached the engineers seeking a solution. In either event the two

got together and an agreement was made whereby the engineers would study the system, measure the water, and make a recommendation as to how the water should be divided. A special committee, consisting of A. G. Barber, a local businessman, and G. L. Swendsen, Professor of Irrigation at the Utah Agricultural College, were to summarize the findings and issue the report.

Two basic tenets of the appropriation doctrine guided Barber and Swendsen in their study. First, "beneficial use is the measure and the limit of the right," which meant that the maximum amount of water that a user could beneficially use would somehow have to be determined. The second tenet was "that the first in time is the first in right." The records had to be searched to find out when certain uses were initiated and how much water could have been beneficially used.

Establishing the time when each canal was built or enlarged, or when each water wheel was put into operation was probably the easiest part of the study. Fortunately, the records were fairly complete as to how many acres of land were irrigated under each canal and how much additional land was included with each enlargement. The difficult part of the project was to determine how much water had been used by each user. The use of water began in 1860, and the first measurement was made in 1893. A 33-year period without measurement is a difficult void to fill.

From 1899 until 1902, Swendsen diligently measured water flowing in all the canals which diverted water from Logan River. In most cases,

time limited Swenden's work to a small number of measurements on each canal. In at least one case, however, he had records spanning one entire irrigation season with each measurement separated by only one to five days. Combining his measurements with those of Fortier he calculated a "water duty" based on the number of acres reported for the average maximum flow and for the mean flow for the measurements given in each year. Satisfied that the "duty" was reasonable for each canal, Barber and Swendsen then went back in time to calculate how much water each user would have required at the time of each enlargement. The power rights were similarly studied using the size of the water wheel, rated horse power, and head available to estimate the amount of water used by each.

The measurements made by Fortier and by Swendsen are expressed in figures of two decimal places with from three to five significant figures (6). Such precision was probably not obtained with the instruments available and was certainly unwarranted in a study of this kind in which a 35 year average was being determined on the basis of a few scattered measurements obtained in only six different years. Undoubtedly the figures were impressive when viewed by the canal company officers. The measurements were, however, made in such a way that good reliability could be expected. Fortier reports that his measurements were made with a current meter. The methods he used follow procedures that are standard practice today. Fortier used three different types of meters, a "Haskell No. 22," a "price acoustic No. 10," and a "Lallie"

or "Bailey" No. 103 or No. 106 (14). Professor Swendsen is assumed to have used similar equipment since both men were skilled in the use of current meters. Both were, at one time or another, employed by the U. S. Geological Survey to measure the flow of Logan River in the mouth of Logan Canyon.

As a result of their findings, Barber and Swendsen assigned eighteen different priorities to the water users. They also prepared a number of tables showing how the river should be divided at different stages. Using their figures, Table 8 and Figure 16 have been prepared. In Figure 15 the water right class has been plotted on a typical hydrograph of Logan River. All rights were fully satisfied with a flow in the river of 289.16 cfs. Below this flow, some rights would be cut off completely while others remained.

A significant part of the Barber-Swendsen report is contained in the last two paragraphs.

> In order that the claims mentioned in this report may be properly distributed, there must be a measuring station established on the Logan River, preferably above all canals . . . Then at the head of each canal, a similar station must be established and rated, and a careful rating table made of each, showing the volumes corresponding to the various depths in the several stations. Combine with these a table of the claims and priorities at various stages of the river and put the entire matter in the hands of a careful water commissioner. Then not only will he be able to justly distribute the water supply, but any watermaster of any of the ditches, by means of similar information, may check the distribution and report with intelligence the actual conditions on his canal, and can more positively regulate its subdivision among the irrigators.

Table 8. Farber-Swendsen Schedule of Water Right Priorities on Logan River - 1902

Class	Appropriator	Priority	Max. flow cfs Irrigation	Power	Accumulated diversion from Logan River cfs
	Logan & Hyde Pk.	1860	46.78		
1	Southwest field	1860	10.68		57.46
	Thatcher M&E Co.	1860		58.46	105.24
	Logan & Benson	1861	23.48		105.24
2	Fullmer Irr. Co.	1861	3.63		108.87
	Logan Island	1861	6.00		108.87
	Logan & Richmond	1864	45.32		154.19
	Logan Hollow	1864	2.25		156.44
3	Deseret Mills	1865		17.03	156.44
5	Central Mills	1869		9.03	156.44
	Hyde & Preston Mill	1873		3.75	156.44
	Danielson Mfg. Co.	1873		13.33	169.77
6	Peter Affleck Shop	1873		0.76	169.77
	Hercules Power Co.	1873		20.06	169.77
	Anderson & Sons Lumber	1873		1.31	169.77
7	U. C. Foundry	1876		6.16	169.77
8	Providence	1878	8.79		178.56
	Logan & Benson	1880	5.83		184.39
	Logan Hyde Park & Smithfield	1880	41.42		225.81
9	Hercules Power Co.	1880		20.56	225.81
	Thatcher M&E Co.	1880		23.16	243.14
	Deseret Mills	1880		9.81	243.14
10	Central Mills	1881		13.56	243.14
	Logan & Richmond	1881	21.68		264.82
11	Logan & Benson	1887	5.83		264.82
12	Deseret Mills	1888		13.01	264.82
13	Logan Hyde Park	1889	6.21		271.03
14	Logan & Richmond	1890	7.97		279.00
15	Hercules Power Co.	1893		2.00	
	Logan Hyde Pk. & Smfl.	1893	4.16		285.16
16	C. C. Blumel	1899		65.00	285.16
17	Peter Affleck	1900		2.56	285.16
18	Thomas Smart Jr.	190.	4.00		289.16

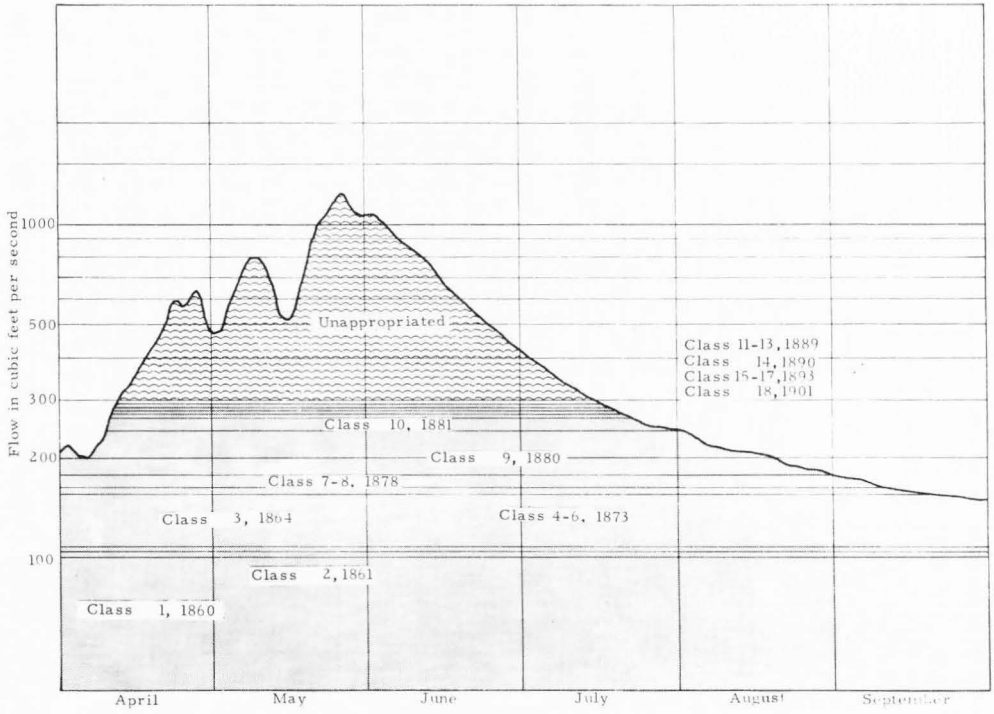

Figure 16. Extent of water appropriated under the Barber-Swendsen distribution schedule.

The Barber-Swendsen report had only one serious weakness. It was not a legal document. It relied solely on the good will and cooperation of all the users to make it effective. If one user disagreed with the report, there was no way to enforce his compliance.

Logan River Water Users' Association

It has been mentioned that the only way the water users could benefit from the Barber-Swendsen report was to be united and cooperative in accepting the report as the "law" of the river. It was apparently a cooperative spirit that called for the report in the first place, and the spirit seemed to continue, as evidenced by the fact that on January 20, 1906, all of the users--both power and irrigation--voluntarily associated themselves together in a formal, although not incorporated, organization known as the Logan River Water Users' Association.

The articles of agreement stated:

> The purposes for which said organization is formed are: To devise ways and means for an amicable and just settlement of all controversies among members of the organization concerning the division and use of the waters of Logan River; to protect the water rights of the members of said Logan River from interference or injury by any nonmember of the association: to consider, propose, and if possible, to secure, the passage of such legislation concerning water, water courses, and irrigation as will be of benefit to said members as well as to the community at large; and to urge and assist the proper authorities in the enforcement of all just laws pertaining thereto. (3)

That the association accepted and recognized the Barber-Swendsen report is borne out in Article XI as follows: "All expenses incurred by

the association in excess of the membership fees shall be borne by the members in proportion to the water rights of such members as shown by the Swendsen-Barber Report." If this original association operated then as the association did in 1961, the expenses incurred would be for the salary of a water commissioner. There appears to be a lapse in the record, however, and it is not known if commissioners were appointed or who they were if appointed. The most likely guess is that no commissioners were used until after the Call decree, which specifically outlined the method used by the later association. One of the earliest known commissioners was George D. Clyde, but his services began in the 1920's which was after the Barber-Swendsen report and the Call decree had been supplanted by the Kimball decree.[2] The association was effective in protecting the rights of its members and particularly effective in evolving the distribution techniques of using a "schedule" so that each appropriator could evaluate his right at any stage of the river.

State Engineer's hydrographic survey

The method proposed by the legislators in 1903 to determine water rights was briefly as follows:

---

[2]Mr. Clyde is mentioned in the files of Civil Suit No. 3055 as having been employed as an engineer during the dispute of 1926. Records of the Logan River Water Users' Association indicate that Mr. Clyde continued to render engineering service during the early 1930's.

1. The State Engineer would make a complete hydrographic survey of a river system. This survey would include a map showing the river, all the canals diverting water from the river and the acreage under each canal, and each property owner using water.

2. The State Engineer would file the hydrographic survey with the County Clerk and then send notices to each property owner listed on the survey, asking him to appear at the clerk's office and claim his water right. The clerk provided a special form on which all pertinent information could be placed. A date was set some eight months after serving of notice beyond which no claims would be accepted. Failure to assert a claim would result in forfeiture.

3. At the end of the filing time, a referee was to be appointed to prepare a proposed determination. The proposed determination would be presented to the court, and a decree would be issued. The court decree would be the final word and would be binding on all parties involved.

If the hydrographic survey was complete and if all users responded and were made parties to the case, this method would settle all questions as to water rights presently existing. All future rights would have to be initiated by application to the State Engineer, who could then intelligently approve or disapprove on the basis of the decree and the hydrographic survey. Any error in the hydrographic survey or in the judgment of the referee would be perpetuated in the decree and could result in something quite unworkable.

The Logan River was one of the first river systems surveyed under this law and probably the "test" to determine how workable the new method was going to be. The State Engineer, Caleb Tanner, reported in 1910,

> . . . the area irrigated from the Logan River in Cache County was surveyed during the season of 1909, and in addition to the rights for irrigation all other rights to the use of the water of Logan River were made a subject of official investigation and report . . . (42)

His report also showed that "the total area watered by Logan River is 55 square miles, 54 of which have been mapped." The total irrigated acreage reported at this time was 19,200 acres.

Mr. Tanner's report two years later indicated that 22,265 acres were irrigated by 682 canals and ditches. The maximum flow diverted for irrigation was 344.74 cfs. This information, all part of the hydrographic survey completed in 1910-11, was submitted to the court in 1912. It must have been a complete and comprehensive survey. Unfortunately, the survey is at present missing, and cannot be located in the county or state records.

There is ample evidence to show that the survey was presented to the court and that the next step in the process to determine rights was also taken. In June of 1912 notices were sent to all water users and a notice was published in the Logan Republican newspaper requiring all water users to appear and file claims. On file in the County Clerk's office, in a dusty box marked "Miscellaneous," are numerous claims

properly filled out and signed by the claimants. No one seems to know what happened from this point on. Apparently no referee was ever appointed and certainly no decree was ever issued.

The new method may not have been popular with the people and may not have had the full support of the court. The fact that the costs of the survey and the determination were to be taxed upon the users would serve to dull their enthusiasm for such a method. The newspaper, the Logan Journal, in an editorial dated August 10, 1912, may have expressed what was a popular sentiment.

> More than 800 residents of Logan, and of other towns that draw water from Logan River as a source of water for irrigating purposes, have been favored with notices from the office of the County Clerk requiring them to set forth in specific--very specific--terms; just how, when, and where they acquired right, title and interest in and to the water they use for irrigating purposes:
>
> The nature of the use upon which the claim is based;
> The flow per second;
> The time during each year when such water is used;
> The name of the stream from which it is diverted;
> The place from which it is diverted;
> The dimension, grade, slope, and nature of the diverting channel;
> When the diverting channel was completed;
> The time water was used during the first year;
> The date and nature of any changes made in the diverting channel;
> The place where, and the manner in which the water was first used;
> Every change in the manner of use;
> and so on, ad infinitum, ad nauseam.
>
> Now the county clerk is not seeking this as idle information, or for diversion, but as a requirement of the law enacted by the Legislature of Utah.
>
> The law provided that as rapidly as the hydrographic surveys of the State should be completed in the portions so completed the County Clerk should cause to be sent to each corporation and claimant as far as known, claiming the use of water in such districts, a notice requiring them to present claims and establish rights in the manner set forth in the law and followed in the notices. Moreover, notice

should also be served by publication; which was done in a notice of about two inches in length published in the Logan Republican in June. Six months from the date of publication is given in which to file claims, with sixty days of grace after which, in accordance with the law, all claims not recorded as required will be declared forfeited.

If this law does not deserve to be classed among the "fool" laws; it is at least badly designed and poorly executed.

If it must be complied with literally, many a water user with a primary right dating even from pioneer days, will lose it.

To fully establish his claim under the conditions required would require him to employ the services of an engineer, an attorney; to obtain the records--if any were kept, which is doubtful--of his canal or ditch company and the sworn statements of old residents. And, in addition, he would have to be blessed personally with a very long and accurate memory.

In behalf of hundreds of water users in the Logan River district we appeal to the State Engineer for aid to some simpler method of establishing rights, if he may, under the law, suggest them.

He, and every other old resident, must know that not more than one water user in one hundred can tell the number of second feet flowing in the canal from which he draws his supply, and not one in a thousand irrigators could tell the number of inches or amount of flow to which he is entitled. In no part of Utah has water for irrigating purposes been so finely divided.

Suppose that each individual files a separate claim and the canal companies each file claims. It would be safe to assert that the individual's claims would represent a volume of water ten times as large as Logan River, and several times larger than the total aggregate claims made by the canal companies, for they have a record.

The logical way would have been to make each canal or ditch company prove its claim, and leave to it the apportionment among the several stockholders.

We appeal to State Engineer Tanner for an explanation of the simplest form of proof that will be accepted, and for any information he can give that will be of aid in the required proofmaking, for the law, as read by the layman, is impracticable and impossible. (35)

The editor probably misinterpreted the reason for notifying all individual water users. Individual stockholders were not required to file a claim--but were required to "appear" in order that the record be complete and make all possible users parties to the action. The form used by the County Clerk is almost identical in content if not in format to the form used by the State Engineer today.

The first legal dispute--the Call decree

The Barber-Swendsen report received its first test in 1914. Apparently the suggestion made in the report regarding measuring devices and distribution by a "careful" commissioner were overlooked by the water users. Such a procedure would have averted any argument. Having only one man making changes in headgate deliveries and this according to an approved schedule reduces the possibility of "unfair" apportionment. When each user is allowed to make his own headgate changes, there is a definite possibility that he might "err" in favor of his own company. If his company is the first to divert from the river, he may not leave enough water in the river to fully satisfy the last user's rights. Whether real or imagined, this type of situation precipitated an argument during the 1914 season.

The complaint filed in the District Court on January 11, 1915, pitted all the users on the lower canal, both power and irrigation, against the two upper canals, the Utah Agricultural College, and the Smart ditch. The only user not associated with the case was the Utah Power and Light

Company, which had just acquired right to the telluride plant in the mouth of the canyon. Logan City did not as yet have any rights except as a stockholder in the Logan, Hyde Park, and Smithfield Canal, and as a power user further upstream.

The Utah Agricultural College was involved because there was some belief that varying the head in the State Dam, which had been completed in 1913, created a significant seepage loss in the river. A special committee was appointed to determine the extent and probable location of the loss. This committee consisted of Engineer Eugene Schaub, representing the Logan River Water Users; Engineer Ray B. West, representing the Utah Agricultural College, and a third disinterested party, State Engineer W. D. Beers. The determination of the physical facts was assigned to the State Engineer and at his request the work was undertaken by the District Office of the Water Resources Branch, U. S. Geological Survey. The physical measurements were made between September 9 and October 17, 1916, and a report issued November 30, 1916 (23). This conflict was not part of the original complaint but added later to give the case the tone of a "general" adjudication over a portion of the river system.

The original complaint (44) stated in part,

> 31. That in the year 1902, a controversy arose between Plaintiff Thatcher Milling and Elevator Company, defendant Logan Hyde Park Canal Company, and the grantor and predecessors in interest of the other parties to this action in respect to the quantity and priority of the water rights of the said Thatcher Milling and Elevator Company. The

> Logan, Hyde Park, and Smithfield Canal Company and the grantors and predecessors in interest of the other parties to this action, and thereupon and for the purpose of settling such controversy, and to obtain a basis for the distribution of the waters of Logan River, Messrs. A. G. Barber and Geo. L. Swendsen were employed to ascertain the date of appropriation of water from Logan River and the quantity appropriated by the said . . . parties to this action. That thereafter, and in the year 1902, the said A. G. Barber and Geo. L. Swendsen made a report in writing of investigations made by them, and their findings as to the dates of appropriation of water and the quantities appropriated . . .

The rest of paragraph 31 outlines the findings of Barber and Swendsen and lists the various classes of water right and the flow apportioned to each user in each class.

> 32. That when said report was made, to wit, in the year 1902, it was mutually agreed by the plaintiff(s) and defendant(s) . . ., that their respective rights to the water of Logan River, both as to quantity and priority of appropriation should be as set forth in said schedule as hereinbefore stated, except that it was mutually agreed that grantor and predecessor in interest of plaintiff Logan North West Field Irrigation Company should be entitled to ten cubic feet per second of water in excess of the amount awarded in said report and in excess of the amount hereinbefore stated in the schedule.

An amended complaint later added another exception to the Barber-Swendsen report giving the right to the Logan Island Irrigation Company to divert eight second feet of water at a point below the tailrace of the Logan Stone and Monument Company.

Paragraph 34 continues:

> That in the year 1914, the defendants . . . wrongfully diverted at various times during the irrigation season, more water than the defendants were entitled to and that they thereby diminished the quantity of water to which

> the plaintiffs were and had been entitled and prevented the plaintiff from the use thereof at such times and in such quantities as the plaintiffs were entitled as aforesaid . . .

The sore spot that probably was really troubling the lower canal users is indicated in paragraph 36.

> That plaintiffs are informed and believe and allege that the defendant, Logan, Hyde Park, and Smithfield Canal Company, has heretofore conveyed to Logan City one-third of the water formally owned by it and to which it was entitled from Logan River.

It is conceivable that in the transfer to Logan City a real reduction in the flow diverted by the Logan, Hyde Park, and Smithfield Canal would not take place; that the canal company would continue to divert into its canal the amount specified by the report and that Logan City would also divert an amount equal to one-fifth of the canal company's portion of the river, making a total of six-fifths diverted. The extra one-fifth would of course come from the lower user's rights. When the decree was issued this is actually what happened. Logan City surrendered stock in the upper canal to receive a vested right in the river from the lower canal.

It took a full year of legal maneuvering, demureres, cross complaints, amended complaints, restraining order, etc., before the water users got down to the serious task of settling the dispute.

During the summer of 1916, the water users, in consultation with their engineers, sat down and worked out what, to all concerned, was a workable solution. Bishop, in his glowing but inaccurate analysis of this period, speaks of a "round table" discussion taking place by the

water users with the engineers sitting in as consultants. In this he may be right, but in his evaluation of the position of the attorneys in the situation he is inaccurate. This "round table" discussion came about after a full year and a half of legal manipulation in an effort to define the problem and to associate all parties who might be concerned with the issues. The "round table" discussion was to avert the calling in of a referee by the court to decide the issues. The decree which resulted was not the Bear River decree as implied by Bishop (7).

One very unusual and important decision came out of the "round table" discussions. The decision is stated in a stipulation prepared in June 1916 and signed by all parties to the suit as follows:

> That the priorities of these various appropriations of the waters of Logan River, ranging in point of time from the year 1860 to the year 1901, may, as among themselves, and for the purposes of the determination of this cause, be disregarded, and that the respective rights of the said parties to the use of the waters of Logan River may, to the extent of their several amounts, as hereinafter specifically set forth be treated as of equal dignity. (44)

The Barber-Swendsen report divided the water rights into 18 separate classes according to date of initiation (6) which made distribution cumbersome and complicated. The later priorities were completely without water at certain stages of river flow. This often resulted in considerable financial loss if crops were planted on the basis of a more optimistic outlook. The market value of the right was diminished because of the difficulty in predicting firm water supplies. With a single priority system all appropriators share in the total river

flow--no one is ever completely without water. The probability of securing a crop can be more easily determined and the market value of the right can be more easily established and maintained. The distribution problems are reduced in direct proportion to the number of priorities dropped. The Logan River water users made a great stride forward when all appropriators were assigned one priority.

The "schedules," which resulted from the "discussions" and were drawn up by engineer Eugene Schaub were not flawless, but they were an improvement over the Barber-Swendsen report. Actually, 12 separate schedules were prepared, each covering a different stage in the river flow or a period of time during the year. Schedules "A" to "D" covered the period from July 1 to September 15, schedules "H" to "K" covered the period from April 15 to July 1 and from September 15 to October 15; and schedule "L" covered the winter period from October 15 to April 15. The proportionate share of each appropriator differed with each different period but remained constant in any one particular period. The distribution of water under the Call decree is shown in Table 0 and illustrated on a hydrograph in Figure 17. The schedules were workable but the soundness of changing time periods may be questioned. The flow in the river is not governed strictly by the calendar and shifting from one schedule to another on July 1 could result in some awkward and unrealistic headgate changes depending upon what the river stage happened to be on that day. It will be seen later that this "time" philosophy was introduced into the

Table 9. Distribution schedule for Logan River as proposed by the "Call" decree

SCHEDULES A, B, C, & D Operative July 1 to Sept. 15

RIVER STAGE C F S

No.	Appropriator	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	263	264	265	266	267	270	280	290	300	310	320	330	340	350	360	370	380	390	400	410	420	430
1.	Logan Stone and Mon. Co.	3.672	3.978	4.284	4.590	4.896	5.202	5.508	5.814	6.120	6.426	6.732	7.038	7.344	7.650	7.956	8.048	8.048	8.048	8.048	8.048	8.140	8.446	8.752	9.058	9.364	9.670	10.173	10.676	11.184	11.692	12.199	12.199	12.199	12.199	12.199	12.199	12.199
2.	Providence Pioneer	1.584	1.716	1.848	1.980	2.112	2.244	2.576	2.508	2.640	2.772	2.904	3.036	3.168	3.300	3.432	3.432	3.432	3.432	3.432	3.432	3.511	3.643	3.775	3.907	4.039	4.171	4.388	4.605	4.824	5.044	5.264	5.497	5.729	5.963	6.197	6.447	6.696
3.	Logan City	4.596	4.979	5.362	5.745	6.128	6.511	6.894	7.277	7.660	8.043	8.426	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
4.	Logan-Hyde Park and Smithfield	21.612	23.413	25.214	27.015	28.816	30.617	32.418	34.219	36.020	37.821	39.622	40.232	42.419	44.600	46.784	47.439	47.439	47.439	47.439	47.439	48.302	51.175	54.049	59.962	65.876	72.235	75.991	79.745	83.541	87.334	91.128	95.138	99.150	103.207	107.263	111.588	115.913
5.	Logan Hollow	0.684	0.741	0.798	0.855	0.912	0.969	1.026	1.083	1.140	1.197	1.254	1.311	1.368	1.425	1.482	1.499	1.499	1.499	1.499	1.499	1.516	1.573	1.630	1.687	1.744	1.801	1.895	1.989	2.106	2.202	2.298	2.399	2.500	2.500	2.500	2.500	2.500
6.	Hyde Park and Logan N. F.	16.548	17.927	19.306	20.685	22.064	23.443	24.822	26.201	27.580	28.959	30.338	31.717	33.096	34.475	35.854	32.267	32.267	32.267	32.267	36.267	36.474	37.164	37.853	38.543	39.232	39.932	40.611	41.301	41.990	42.680	43.369	44.059	44.749	45.438	46.128	46.817	47.507
7.	Logan Island	2.388	2.587	2.786	2.985	3.184	3.383	3.582	3.781	3.980	4.179	4.378	4.577	4.776	4.975	5.174	5.234	5.234	5.234	5.234	5.234	5.293	5.492	5.691	5.890	6.089	6.288	6.615	6.942	7.244	7.573	7.902	8.252	8.600	8.952	9.305	9.680	10.055
8.	Logan & Northern	27.600	29.900	32.200	34.500	36.800	39.100	41.400	43.700	46.000	48.300	50.600	52.900	55.200	57.500	59.800	60.490	60.490	60.490	60.490	60.490	61.180	63.480	65.780	68.080	70.380	72.235	75.991	79.745	83.541	87.334	91.128	95.138	99.150	103.207	107.263	111.588	115.913
9.	Providence Logan	3.912	4.238	4.564	4.890	5.216	5.542	5.868	6.194	6.520	6.846	7.172	7.498	7.824	8.150	8.476	8.574	8.574	8.574	8.574	8.574	8.672	8.998	9.324	9.650	9.976	10.302	10.883	11.368	11.910	12.451	12.991	13.564	14.136	14.714	15.292	15.292	15.292
10.	7th Ward	0.696	0.754	0.812	0.870	0.928	0.986	1.044	1.102	1.160	1.218	1.276	1.334	1.392	1.450	1.508	1.525	1.525	1.525	1.525	1.525	1.543	1.601	1.659	1.717	1.775	1.833	1.928	2.023	2.023	2.023	2.023	2.032	2.032	2.032	2.032	2.032	2.032
11.	Thomas Smart																	1.000	2.000	3.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
12.	Thatcher Irr. Co.	0.228	0.247	0.266	0.285	0.304	0.323	0.342	0.361	0.380	0.399	0.418	0.437	0.456	0.475	0.494	0.500	0.500	0.500	0.500	0.500	0.505	0.524	0.543	0.562	0.581	0.600	0.631	0.662	0.693	0.723	0.754	0.754	0.754	0.754	0.754	0.754	0.754
13.	Thatcher M & E	33.804	36.621	39.438	42.255	45.072	47.889	50.706	53.523	56.340	59.157	61.974	64.791	67.605	70.425	73.242	74.007	74.087	74.087	74.087	74.087	74.932	77.749	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566	80.566
14.	U. O. Foundry	2.676	2.899	3.122	3.345	3.568	3.791	4.014	4.237	4.460	4.683	4.906	5.129	5.352	5.575	5.798	5.865	5.865	5.865	5.865	5.865	5.932	6.155	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378	6.378
15.	Wm. Affleck	3.690	3.900	4.310	4.610	4.920	5.220	5.540	5.830	6.140	6.450	6.750	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000
16.	Central M & E	11.850	12.960	13.850	14.800	15.860	16.830	17.780	18.770	19.820	20.750	21.780	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590
17.	H. Sumner Hatch	20.940	22.660	24.400	26.190	27.860	29.630	31.400	33.160	34.840	36.640	38.350	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850
18.	Anderson & Sons	7.682	8.323	8.963	9.603	10.244	10.884	11.524	12.164	12.805	13.445	14.085	14.725	15.365	16.005	16.646	16.838	16.838	16.838	16.838	16.838	17.030	17.670	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310	18.310
19.	Benson Irr. Co. & Logan N. W. Field	20.130	21.807	23.485	25.162	26.839	28.517	30.195	31.822	33.549	35.227	36.904	38.502	40.258	41.937	43.614	44.117	44.117	44.117	44.117	44.117	44.621	46.299	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974	47.974
20.	Logan Island	3.672	3.978	4.284	4.590	4.896	5.202	5.508	5.814	6.120	6.426	6.732	7.038	7.344	7.650	7.956	8.048	8.048	8.048	8.048	8.048	8.140	8.446	8.752	9.058	9.364	9.670	10.173	10.676	11.184	11.692	12.199	12.199	12.199	12.199	12.199	12.199	12.199

SCHEDULES E, F, G, & H Operative April 15 to July 1 & Sept 15 to Oct 15

1.	Logan Stone and Mon. Co.	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.999						
2.	Providence Pioneer	1.468	1.600	1.740	1.870	2.060	2.140	2.280	2.418	2.552	2.688	2.824	2.940					3.420	3.420	3.420	3.420	3.460	3.600	3.720	3.860	3.970	4.140	4.350	4.580	4.800	5.000	5.264						
3.	Logan City	4.596	4.979	5.362	5.745	6.128	6.511	6.894	7.277	7.660	8.043	8.426	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000						
4.	Logan-Hyde Park and Smithfield	19.989	21.861	23.740	25.598	27.421	29.381	31.145	33.085	34.950	36.814	38.677	39.310	40.758	42.206	43.654	45.102	46.550	46.550	46.555	46.555	47.540	50.471	53.487	59.122	65.115	71.588	75.468	79.403	83.392	87.265	91.128						
5.	Logan Hollow	0.633	0.690	0.752	0.804	0.866	0.925	0.965	1.040	1.101	1.156	1.211	1.280	1.319	1.357	1.396	1.434	1.473	1.473	1.473	1.473	1.490	1.550	1.620	1.670	1.720	1.780	1.880	1.982	2.090	2.195	2.298						
6.	Hyde Park & Logan N. F.	15.289	16.729	18.175	19.566	21.017	22.420	23.879	25.290	26.615	27.945	29.276	31.010	31.948	32.886	33.824	34.762	35.700	35.700	35.700	35.700	35.930	36.623	37.200	38.114	39.908	39.649	40.436	41.150	41.785	42.632	43.369						
7.	Logan Island	2.220	2.141	2.620	2.820	3.021	3.235	3.440	3.650	3.855	4.060	4.265	4.470	4.606	4.742	4.878	5.014	5.150	5.150	5.150	5.150	5.200	5.410	5.620	5.820	6.040	6.230	6.570	6.900	7.210	7.500	7.902						
8.	Logan & Northern	25.547	27.915	30.290	32.612	35.027	37.410	39.730	42.182	44.541	46.900	49.259	51.620	53.196	54.772	56.348	57.924	59.500	59.500	59.500	59.500	60.251	62.503	64.985	67.475	69.616	71.588	75.488	79.403	83.392	87.265	91.128						
9.	Providence Logan	3.625	3.950	4.290	4.620	4.960	5.300	5.750	5.970	6.308	6.646	6.984	7.320	7.544	7.768	7.992	8.216	8.440	8.440	8.440	8.440	8.550	8.900	9.210	9.550	9.967	10.200	10.788	11.307	11.900	12.434	12.991						
10.	7th Ward	0.645	0.705	0.762	0.823	0.881	0.940	1.000	1.060	1.120	1.180	1.240	1.300	1.340	1.380	1.420	1.460	1.500	1.500	1.500	1.500	1.540	1.580	1.640	1.700	1.760	1.815	1.910	1.995	2.000	2.015	2.023						
11.	Thomas Smart	-0-	-0-															1.000	2.000	3.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000						
12.	Thatcher Irr. Co.	0.213	0.233	0.254	0.270	0.286	0.306	0.338	0.348	.368	.388	.408	0.430	.443	.455	.468	.480	0.493	0.493	0.493	0.493	0.496	0.514	0.534	0.555	0.575	0.594	0.625	0.660	0.690	0.720	0.754						
13.	Thatcher M & E	31.295	34.228	37.085	40.112	42.933	45.812	48.719	51.580	54.515	57.450	60.385	63.320	65.259	67.198	69.137	71.070	73.014	73.014	73.014	73.014	73.693	76.779	79.684	79.830	80.019	80.102	80.190	80.300	80.391	80.559	80.566						
14.	U. O. Foundry	2.480	2.700	2.930	3.160	3.400	3.620	3.860	4.100	4.325	4.550	4.775	5.000	5.152	5.304	5.456	5.608	5.760	5.760	5.760	5.760	5.850	6.070	6.300	6.304	6.310	6.314	6.315	6.320	6.350	6.370	6.378						
15.	Wm. Affleck	3.410	3.730	4.045	4.360	4.660	4.980	5.320	5.620	5.938	6.255	6.573	6.890	6.912	6.934	6.956	6.978	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000	7.000						
16.	Central M & E	10.980	12.020	13.030	14.090	15.070	16.050	17.100	18.110	19.141	20.171	21.202	22.210	22.286	22.362	22.438	22.514	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590	22.590						
17.	H. Sumner Hatch	13.385	21.178	22.940	24.822	26.603	28.402	30.159	31.950	33.768	35.585	37.403	39.220	39.346	39.472	39.598	39.724	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850	39.850						
18.	Anderson & Sons	8.890	9.540	10.131	10.751	11.317	11.880	12.421	12.993	13.602	14.210	14.819	15.428	15.825	16.222	16.618	17.015	17.412	17.412	17.412	17.412	17.568	18.200	18.818	18.757	18.741	18.697	18.653	18.531	18.449	18.384	18.310						
19.	Benson Irr. Co. & Logan N. W. Field	22.700	24.320	25.840	27.360	29.000	30.600	32.220	33.723	35.336	36.949	38.562	40.176	41.233	42.290	43.347	44.404	45.463	45.463	45.463	45.463	45.865	47.623	49.016	48.973	48.902	48.823	48.566	48.462	48.259	48.049	47.974						
20.	Logan Island	4.172	4.558	4.744	5.030	5.316	5.602	5.888	6.174	6.460	6.746	7.032	7.318	7.506	7.694	7.882	8.070	8.258	8.258	8.258	8.258	8.340	8.626	8.912	9.198	9.484	9.770	10.253	10.736	11.224	11.712	12.199						

at river stage above 360 cfs, distribution during this period is the same as schedules A, B, C, & D for period July 1 - Sept. 15.

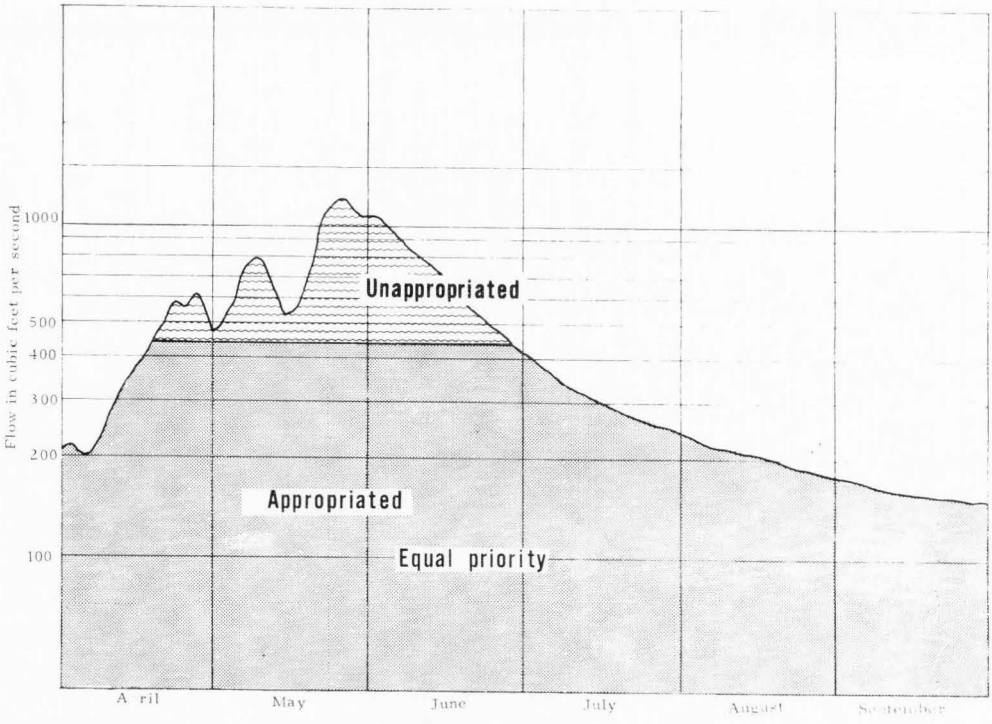

Figure 17. Extent of water appropriated under the "Call" decree distribution schedule.

Kimball decree, but eliminated from the Logan River schedule in that decree.

The final decree was issued and signed by Judge Call on December 31, 1916, without trying the issues and without determining the "findings of facts and conclusions at law" either by referee or by counsel. All differences between plaintiffs and defendants were resolved by stipulation (44).

The decree defined the irrigation season as beginning on April 15 of each year and continuing until October 15, both dates inclusive. It also demanded that

> Each of the said parties, plaintiff and defendant, is required within a reasonable time to install and thereafter to maintain at its point of diversion, at its own cost and expense, reasonably adequate diverting dams . . . and up-to-date headgates and measuring devices [like those] now in general use in the vicinity, so as to enable a watermaster to measure and distribute the waters of Logan River in accordance with the terms of this decree, and that where any of the water of Logan River is lost or wasted by reason of failure . . . to construct and maintain reasonably adequate diverting works, such loss shall be charged in the distribution to the owners of such defective and inadequate . . . works. (44)

In the event that the parties should not agree upon the distribution or fail to provide adequate diverting works, or fail to pay their share of the expense of the distribution, the court would appoint a water commissioner "who shall have the power to enforce the terms of the decree." (44) The last paragraph of the decree implies that the water users themselves may appoint a water commissioner and that such an appointment would be just as binding as if the court had made the

appointment.

> . . . [each] of the parties named in this decree is enjoined and restrained from in any manner interfering with, or altering or changing the flow of water distributed by said commissioner to any of the other parties or to itself. (44)

An interesting question arises at this point. The State Engineer in 1912-13 called for water claims to be filed with the County Clerk for the express purpose of determining the water rights on Logan River. An expensive hydrographic survey had just been completed. In 1914 the dispute discussed above was begun and legal action started. The State Engineer was called in to measure some water loss in a dam pertinent to the case, but in none of the documents examined was the State Engineer ever mentioned as being interested in the case. He was not a party to the action and nowhere can any evidence be located that indicates what happened beyond the filing of the claims. The claims are still being diligently guarded by the County Clerk, but no use has ever been made of them. Why didn't the State Engineer follow through? This is an interesting unanswered question.

The Kimball decree

Within a few short months after the signing of the Call decree, another suit was opened to determine water rights, this time on Bear River, to which Logan River is tributary. The Utah Power and Light Company acquired title to an existing power right on Logan River in 1913, but was not a party to the suit which resulted in the Call decree

in 1916. Utah Power and Light was rapidly expanding its power activities during this period and had already acquired water rights on the Bear River, including storage in Bear Lake, power stations in Idaho, and a power plant near the western edge of Cache Valley where the Bear River flows into Box Elder County. The company wanted to expand and to build larger and better plants where conditions were feasible to do so. A great power potential existed on the Bear River but, unfortunately, the water rights were vague and undetermined. Title to the water rights would have to be quieted and all clouds removed before sound expansion could take place.

In order to quiet titles the Utah Power and Light Company filed a complaint with the County Clerk on August 21, 1917 (46). The complaint states:

> Each and any of all the defendants herein pretend to have some right or interest in and to the use of waters on said Bear River and/or its tributaries adverse to the right of the plaintiff and claim to be entitled to use the water diverted by them respectively, as hereinbefore alleged, but upon information and belief, plaintiff avers that the claim and rights of the defendants in and to the use of the waters of the said river and/or its tributaries, if any they have, are subject and subordinate to the rights and appropriation of the plaintiff hereinbefore described; that the said claim on the part of the defendants are clouds upon the title of the plaintiff to its said appropriation, permits, and water rights and tends to depreciate the value thereof, and to prevent plaintiff from receiving the full benefit of its said property, water rights and water appropriation.

The plaintiff "prays . . . that all defendants be required to set forth the nature and extent of their respective claims . . ."

It is wondered if the editor of the Logan Journal felt any better about this call for claims than he did about claims called for by the State Engineer in 1912. There was one essential difference--the present case was a private suit to quiet title, with the potential threat of having existing rights forfeited in favor of a powerful industrial giant, the Utah Power and Light Company. The motivating force was stronger than when the State Engineer called for claims. Each claimant became a real "defendant." This was not necessarily so with the former case because the State Engineer was not interested in acquiring title, but only in protecting and defending the law.

Approximately five years elapsed while all the claims were filed and testimony heard from the many and varied witnesses in the case. Each claim was investigated and verified by the plaintiff and some equitable distribution of the water decided. Claims were sometimes vague and meaningless, as far as describing precisely where or what the water right was. Nevertheless, these vague descriptions were included and eventually appeared in the final decree signed February 21, 1922, by Judge James N. Kimball. Distribution of water under the Kimball decree is shown in Table 10.

The new document purported to be the "law" of the river and has as such weathered some rather serious storms. It has never been set aside, however, although amendments and changes have come.

So far as the Logan River is concerned the Kimball decree is little different from the Call decree. Logan River is the only system

Table 10. Distribution schedule for Logan River as proposed by the "Kimball decree", Feb. 21, 1922

Schedule "A"

Appropriators	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	263	264	265	266	267	270	280	290	300	310	320	330	340	350	360	370	380	390	400
Logan, Hyde Park & Smithfield	21.6	23.4	25.2	27.0	28.8	30.6	32.4	34.2	36.0	37.8	39.6	40.2	42.4	44.6	46.8	47.4	47.4	47.4	47.4	47.4	48.3	51.2	54.2	60.0	65.9	72.2	76.0	79.7	83.5	87.3	91.1	95.1	99.1	103.2
Thos. Smart																	1.0	2.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Logan & Northern Irr., Co.,	27.6	29.9	32.2	34.5	36.8	39.1	41.4	43.7	46.0	48.3	50.6	52.9	55.2	57.5	59.8	60.5	60.5	60.5	60.5	60.5	61.2	63.5	65.8	68.1	70.4	72.3	76.0	79.7	83.5	87.3	91.1	95.1	99.1	103.2
Providence-Logan Irr., Co.,	3.9	4.2	4.6	4.9	5.2	5.5	5.9	6.2	6.5	6.8	7.2	7.5	7.8	8.1	8.5	8.6	8.6	8.6	8.6	8.6	8.7	9.0	9.3	9.6	10.0	10.3	10.8	11.4	11.9	12.4	13.0	13.5	14.1	14.7
Providence Pioneer Irr., Co.,	1.6	1.7	1.8	2.0	2.1	2.2	2.4	2.5	2.6	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.5	3.5	3.5	3.5	3.5	3.6	3.8	3.9	4.0	4.2	4.4	4.6	4.8	5.0	5.3	5.5	5.7	6.0
Hyde Park Irr. Co. Logan Northfield Irr., Co.,	16.5	17.9	19.3	20.7	22.1	23.4	24.8	26.2	27.6	29.0	30.3	31.7	33.1	34.5	35.9	36.2	36.2	36.2	36.2	36.2	36.5	37.2	37.9	38.5	39.2	39.9	40.6	41.3	42.0	43.7	4.3 7	44.1	44.7	45.4
Logan Northwest Field Irr. Co., Benson Irr. Co.,	20.1	21.8	23.5	25.2	26.8	28.5	30.2	31.9	33.5	35.2	36.9	38.6	40.3	41.9	43.6	44.1	44.1	44.1	44.1	44.1	44.6	46.3	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
Logan Hollow	0.7	0.7	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.5
Logan Island Irr., Co.,	2.4 3.6	2.6 4.0	2.8 4.3	3.0 4.6	3.2 4.9	3.4 5.2	3.6 5.5	3.8 5.8	4.0 6.1	4.2 6.4	4.4 6.7	4.6 7.0	4.8 7.3	5.0 7.6	5.2 7.9	5.2 8.1	5.2 8.1	5.2 8.1	5.2 8.1	5.2 8.1	5.3 8.1	5.5 8.4	5.7 8.7	5.9 9.0	6.1 9.3	6.9 9.7	6.6 10.2	6.9 10.7	7.2 11.2	7.6 11.7	7.9 12.2	8.2 12.2	8.6 12.2	9.0 12.2
Seventh Ward Irr., Co.,	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	1.7	1.7	1.9	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Thatcher Irr., Co.,	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8
Logan City.	4.6	5.0	5.4	5.7	6.1	6.5	6.9	7.3	7.7	8.0	8.4	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Logan Stone & Monument Co.,	3.7	4.0	4.3	4.6	4.9	5.2	5.5	5.8	6.1	6.4	6.7	7.0	7.3	7.6	8.0	8.0	8.0	8.0	8.0	8.0	8.1	8.5	8.7	9.1	9.4	9.7	10.2	10.7	11.2	11.7	12.2	12.2	12.2	12.2
Thatcher Milling & Elevator Co.,	36.5	39.5	42.5	45.5	48.7	51.7	54.7	57.7	60.8	63.9	66.9	69.9	72.9	76.0	79.0	80.0	80.0	80.0	80.0	80.0	80.8	83.9	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0
Central Milling & Elevator Co.,	11.9	13.0	13.9	14.8	15.9	16.8	17.8	18.8	19.8	20.7	21.8	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6
Thatcher M. & E. Co.	20.9	22.7	24.4	26.2	27.9	29.6	31.4	33.2	34.8	36.6	38.3	39.9	33.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.8	39.8	39.8	39.8	39.8	39.8	39.8	39.8	39.8	39.8
Anderson & Sons Co.,	7.7	8.3	9.0	9.6	10.2	10.9	11.5	12.2	12.8	13.4	14.1	14.7	15.4	16.0	16.6	16.8	16.8	16.8	16.8	16.8	16.8	17.0	17.7	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3
Utah Power & Light Co., [Card Right]	9.4	10.2	11.0	11.8	12.6	13.3	14.1	15.0	15.7	16.5	17.2	18.0	18.9	19.6	20.4	20.7	20.7	20.7	20.7	20.7	20.9	21.8	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6
Utah Power & Light Co.,	93.8	101.6	109.4	117.2	125.6	132.9	140.7	148.5	156.3	164.1	171.9	179.8	187.6	195.4	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200

in the decree to apportion water on the basis of a decreed "schedule," which is, of course, a direct result of the former schedules used, such as the Barber-Swendsen schedule and the Call decree schedules. The Kimball decree did adopt the doctrine of using a common priority wherever it could.

The Utah Power and Light did not appear on the Call decree, but it did occupy a rather obvious prominence in the Kimball decree. Logan City's right in the Kimball decree did not change from the 10 cfs maximum allowed in the Call decree.

As with the Call decree, the new decree allowed the users to function without a court appointed water commissioner if they so desired and could do so amicably. The users, through the Logan River Water Users' Association, elected to function without a commissioner and empowered the Association to hire an "engineer" to distribute water to the members. The associates did not hire an engineer on a continuing basis, but only when water shortages stressed the supply.

Amended decree of 1926

One of the failings of the Kimball decree was the omission of some apparently bona fide rights, either because the claimants failed to appear and assert their claims, or because claimants were not properly notified as to the proceedings. Logan City for some unknown reason failed to assert any right to the use of water for power purposes. In 1902, Logan City had acquired an old sawmill site in Logan Canyon

which had been built about 1868. A dam had been constructed across the river to form a pond for the logs and a canal had been built to divert water to the mill site for power purposes. At the time of this acquisition, Logan City posted notice, following statutory procedure, of intention to appropriate 300 cfs from Logan River for power purposes. Thus, Logan City could have asserted claims with priorities of 1868 and 1902 (46).

In 1923, one year after the signing of the Kimball decree, Logan City completely rebuilt the power plant. The new dam provided some storage space in the reservoir which was not a feature of the old dam. Consequently, Logan City could meet its power demands by storing water during the day and releasing water at night during peak demand periods. Such regulation of the river, as much as 60 cfs differential, was detrimental to the irrigators who did not prefer to irrigate at night, and it was also damaging to the Utah Power and Light Company's generating plant, which was downstream from Logan City's plant.

When Logan City refused to install devices to maintain a constant flow in the river, the water users only recourse was through the court. A complaint was filed, and the issues tried in October 1926. The district court held that inasmuch as Logan City was a party to the Kimball decree (Logan City filed a claim for its domestic rights) and had failed to assert its rights that any rights it might have claimed were forfeited. Under judgment of the court, Logan City was restrained from further interfering with the flow of Logan River.

Logan City appealed to the Utah Supreme Court; and, in the meantime, disobeyed the judgment by continuing to regulate river flow. The Supreme Court upheld the decisions of the lower court but ordered the lower court to alter its decree giving Logan City a right to divert water for power purposes with a priority junior to all other users (34). The right of Utah Power and Light Company initiated by application No. 8025 and evidenced by certification No. 1306 bears the priority date of March 29, 1921. Logan City power is junior to this date.

Amended decree of 1963

The 35 years from 1926 until 1961 were without conflict and attest to the workability of the decree even as administered by the Water Users' Association. That conflict should eventually arise and result in litigation serves also to condemn the administrators who were apparently lulled by a sense of false security and the long period of peace. Inasmuch as this case is latest in point of time and because the nature of the problem is of current interest, it will be treated in some detail here. Urban growth in Utah in the last ten years has made it necessary for many municipalities to search for and acquire additional domestic water supplies. The methods used by Logan City may not be typical, and in some respects should be avoided. Nevertheless, the ultimate solution is of the type that should be emulated.

In the Kimball decree the court made provision for the appointment of water commissioners to settle disputes and apportion water, but it

also allowed the water users the privilege of functioning without commissioners as long as they got along without dispute. The users on Logan River elected to keep their unincorporated association for this purpose. When the flow in the river dropped to a point at which the schedule became effective, the Association appointed someone, usually a qualified engineer, to distribute the flow in accordance with Schedule A of the decree. All users accepted the decision of the engineer and referred any objection to the Association. The expense involved in hiring a commissioner was shared by each user according to the schedule of rights proposed in the Barber-Swendsen report. This procedure was a carry-over from an old custom and was never updated to fit the Kimball decree.

The procedure worked well and at a minimum cost to the water users. In some years, because of an adequate water supply, no engineer was appointed, and in other years his tour of duty was short. In either case, no permanent record of daily diversions throughout the season was kept or published, as would have been required if the commissioner had been appointed by the State Engineer. This "apparent economy" of using a qualified engineer in times of stress only and not keeping an exact record of the extent of each user's diversions, including nonmember diversions, left the door open for a gradual encroachment on the rights of the Association by those who had not affiliated themselves with the Association.

As has been indicated in an earlier section, Logan City's use and need for water was continually growing. The right the city acquired

when it moved to DeWitt Springs was for 10 cfs. At the time the move was made, engineer T. H. Humpherys said that this amount if in a properly designed system "would serve 20,000 people." In lamenting the system that existed prior to the move Humphreys placed the blame for the existing water shortage on "poor design." "All the water in Logan River could be turned into the reservoir and not relieve the situation," he reported (30).

Although 10 cfs might have been adequate for 20,000 people in 1914, a similar amount was not adequate to serve 20,000 people in 1961. The justification for such a statement lies in the fact that modern conveniences have increased the per capita consumption. Automatic washing machines, dishwashers, garbage disposals, multiple bathrooms, air conditioners, etc., have increased the rate of consumption. The increased rate of consumption, coupled with the increased number of users and the increased number of lawn sprinklers--and associated with a part of what Humpherys called "poor design" created a water shortage in Logan long before the population reached 20,000 persons.

To reduce the hazard of failure and to relieve an increasingly short supply, particularly in the hot, dry periods of summer, Logan City in 1947 replaced part of the pipeline that supplied culinary water to the city. The original wood stave pipe had been installed in 1914. When the Kimball decree was issued in 1922 the capacity of the pipeline (9.3 cfs) was just about equal to the right granted by the court, 10 cfs.

This was sufficient, however, to provide for substantial growth in the city. The new pipeline installed in 1947 increased the capacity to 13.6 cfs, and when the rest of the wood stave pipe was replaced in 1949, the capacity increased to 19.6 cfs. When the pipe was replaced, additional storage was also constructed. Having increased the pipeline capacity and the storage capacity, Logan City neglected to secure an increase in water rights.

From 1949 until 1957, Logan City kept the doors to the gatehouse at DeWitt Springs tightly closed to strangers. A venturi meter had been installed in the new diversion works in 1949, but no records of the amount of flow were ever disclosed during this period. Even the engineer who designed the measuring station was reluctant to verbally disclose flow figures (40). It was not until 1957 that the other water users on the river asserted themselves, gained access to the measuring device, and discovered that Logan City was diverting water far beyond its right.

The author, in 1957, was employed as an engineer for the Logan River Water Users' Association to distribute the waters of Logan River according to the schedule of rights in the Kimball decree. A private study by the author in 1956 to evaluate the water rights of Central Mill had made him aware of problems on the distribution system and had aroused his curiosity to know the amount of water Logan City was using.

In 1957 the author asked for and received a key to the springhouse. Upon entering and examining the venturi meter he found that the automatic

recorder and flow indicator had been removed from service. He subsequently had to return at a later time with pipe wrenches, fittings, and hoses in order to install a manometer on the meter so that the head loss through the meter could be measured and the flow calculated. The measurement indicated a flow of 20 cfs, which was about 12 cfs in excess of the city's decreed right for that day.

The engineer reported this to the Logan River Water Users' Association, but the season was too far advanced when the information was obtained and the service of the engineer terminated before adjustments could be made. The following year the author attempted to reduce the flow into the city pipeline to the decreed amount. The following day new locks appeared on the springhouse and access to the measuring device was denied. The water users were slow to react, however, and it was not until 1960 that the Logan, Hyde Park, and Smithfield Canal Company filed a petition with the County Clerk asking for an "order to show cause." The order was signed on August 13, 1960, by Judge Lewis Jones and required the city to appear in court and

> (a) give the Company [Logan, Hyde Park, and Smithfield Canal Company] access to the Logan City measuring device at the spring . . . (b) give the company a report of water taken by Logan City for the past four years, (c) be restrained and enjoined from diverting water in excess of the flow awarded to Logan City by the Kimball decree, and (d) be required to furnish to the Company weekly reports of water taken by Logan City in the future. (46)

At the hearing Alton Eames, City Water Superintendent, and the author were directed by the court to make a series of periodic

measurements at the spring and to report to the court. They were joined by Wallace Jibson, engineer with the U. S. Geological Survey, and made their measurements as directed. The results of those measurements are in Table 9.

Table 11 Flow of DeWitt Springs--1960

Date	h	Discharge cfs	Total river flow cfs	Allowed by Schedule A
Aug. 25	0.75	19.15	165	6.3
30	0.71	18.63	156	5.9
Sept. 2	0.50	15.63	159	6.1
6	0.43	14.50	150	5.7
9	0.45	14.83	149	5.7
13	0.45	14.83	144	5.5
19	0.43	14.50	144	5.5

Negotiations failed to bring about a peaceable settlement between the City and the Water Users' Association, so the Association petitioned the State Engineer to have a water commissioner appointed. The State Engineer met with the water users, all water users, not just those in the Association, and set up the necessary organizational structure, including a budget, necessary to the appointment of a commissioner. A commissioner was chosen and subsequently appointed on April 2, 1961.

Any commissioner appointed by the State Engineer is placed under bond to enforce the court decrees applicable to his river system. He has the power of arrest and is required to keep an account of all

diversions under his jurisdiction. Such an appointment 40 years ago would have prevented the situation now facing the Logan River Water Users. His appointment now, though, had great significance. Logan City would not be able to divert excess water without being in direct conflict with an officer of the court, and if a suit were entered the State Engineer would be obligated to defend and, in essence, be "on the side" of the Water Users' Association.

As it happened, the summer of 1961 was one of the driest summers on record. Everyone was "water conscious." The State Engineer received the report from his commissioner that Logan City was exceeding its decreed right, but advised the commissioner to delay action until Logan City and the water users had had time to effect a peaceable solution. When it appeared that no solution was in sight the State Engineer ordered his commissioner to enforce the decree beginning July 17, 1961 (17). On the 14th of July, the City appealed to the Judge for an order restraining the State Engineer, stating: ". . . that if said order is carried out Logan City will suffer great and irreparable damage by reason of its being deprived of sufficient water even for domestic purposes for its inhabitants." (46) Apparent disaster was averted when, at the suggestion of defense attorney E. J. Skeen, the city entered a condemnation suit against the water users and obtained an order to take immediate possession of the water (32). Later in the year the case would be tried to determine if Logan City had obtained any

additional rights in DeWitt Springs as a result of adverse possession or abandonment, and then if necessary the condemnation suit would be tried.

LEGAL ACTION

In answer to the order to show cause, Logan City stated that by reason of adverse possession and abandonment, Logan City had acquired rights to DeWitt Springs over and above that decreed to it in 1922. Logan City assumed that the so-called "abandoned" water was open to the public for appropriation. In 1960 Logan City filed an application to appropriate said water. The State Engineer promptly rejected the application, and Logan City filed an appeal to have the court review the decision of the State Engineer. In compliance with the stipulation made with the Logan River Water Users' Association, Logan City also entered a complaint against the water users with the understanding that if the court decided against Logan City the condemnation suit would then proceed.

The claims of Logan City are best described in the notice of appeal filed April 17, 1961, to seek a review of the decision made by the State Engineer to reject the City's Application No. 32383.

> Plaintiff (Logan City) alleges: . . . That for more than 45 years last plaintiff has diverted from said DeWitt Springs before the same enters or becomes a part of Logan River and has used for its culinary and municipal purposes a flow of water from said spring greatly in excess of the amount awarded to it under the terms of the Kimball decree of February 21, 1922, to the full carrying capacity of its distribution system which, since 1949, has had a total carrying capacity of approximately 20 cfs and that said water so diverted from DeWitt Springs by plaintiff in excess of the amount decreed to it under the Kimball decree, which said amount consists of approximately 14.9 cfs; that said use of said excess flow by plaintiff

has at all times been with the knowledge and acquiescence of those defendants, and each and all of them, so that said defendants, and each and all of them, having rights in Logan River below plaintiff's point of diversion, have lost their right to said water by reason of their failure to use the same for a period in excess of five years last past and said water thereupon reverted to the public because of defendants, and each of them having failed to use said water, and thereby became subject to appropriation under and pursuant to the laws of the state of Utah.

That on or about the 3rd day of October, 1960, plaintiff . . . filed its application in the office of the State Engineer . . . to appropriate all of said water, over and above the defendants' rights under the Kimball decree and such additional rights as it may have obtained by adverse use and possession for a period of more than seven years prior to 1939; . . . (31)

In the complaint filed July 25, 1961, the City alleges,

That plaintiff bases its right to the use of the foregoing water (20 cfs from DeWitt Springs) by virtue of Exhibit A of the so-called Kimball decree, dated February 21, 1922, and also by adverse use, abandonment, forfeiture, nonuse, and by Application No. 32383 . . . (32)

Elements of law

Adverse use. This case can be resolved into two issues--adverse use and forfeiture or abandonment. To quote from Harding,

(a) In order to establish a right by adverse use, the diversion must be, continuous for the statutory period, (7 years in Utah), (b) open, (c) notorious, (d) peaceable, (e) under claim or color of right, and (f) to the damage of the one against whom the right is acquire.

"Open" and "notorious" have similar meanings;

The use must not be secretive . . . it has come to the attention of the one against whom the right has been acquired;

"Peaceable" means that the one against whom the right is being acquired has not interfered with the adverse use . . . mere verbal protests would not be sufficient . . . there must be . . . closing of a headgate . . . or securing an injunction;

> "Under claim of right" means that the use must not have been permissive . . . One method . . . is payment of taxes on right during the period of acquirement;
>
> The "damage" to the one against whom the right is acquired may be difficult to prove if the adverse user has left sufficient water in the stream for the present needs of the lower users. (16)

On this point Hutchin says:

> As the right of the lawful appropriator must be clearly impaired, it follows that there is no adverse use when the supply of water is sufficient for all claimants, and that a prescriptive right against other is not established by merely showing continuous use of the water for the statutory period. (19)

Chandler adds: "The burden of proof is on the claimant of the adverse title and any interference or interruption, however slight, will prevent acquisition of his right. Verbal protests are not considered interruptions." (10)

In 1939, the Utah Legislature added the following to the Utah Water Law: "No right to the use of water, either appropriated or unappropriated, can be acquired by adverse possession." (L. 39, c. 111, p. 148 , Utah Code Annotated 1943.)

Any water right Logan City could have acquired by adverse use would be limited to that water used during some consecutive seven-year period between the time the decree was signed in 1922 (or possibly the amended decree of 1926) and the time the law was passed in 1939 forbidding such acquirement. Since the capacity of the Logan City pipeline during this period was 9.3 cfs, the only water which could be adversely acquired was the difference between the decreed right and the

pipeline capacity. When the river flow drops to a value below 230 cfs, Logan City's decreed right is less than the capacity of the pipeline. It would be necessary to show that Logan City maintained a full pipe during the low flow for seven consecutive years with the knowledge of the water users, to the damage of the water users, and without any interference or interruption from the water users. If this action could be successfully defended by the City, the City would, in essence, have acquired a priority superior to all other users up to the capacity of the pipeline, but as Logan City was diverting nearly 20 cfs, the excess over 10 cfs would have to be acquired upon some other premise. As stated in the complaint against the water users, Logan City claimed that 10 cfs was acquired by application after having been abandoned by the water users.

Abandonment. The Utah code states that, "When an appropriator or his successors in interest shall abandon or cease to use water for a period of five years the right shall cease . . ." (26) In view of the fact that beneficial use is the basis, the measure, and the limit of the right, it follows as a corollary that when the use ceases the right ceases. This issue was first decided in California in the case of Smith vs Hawkins in 1895. This decision has been the basis for specific legislation in virtually all of the Western States, including Utah, as quoted above.

The courts have agreed upon the construction of the statute on the following points:

1. A right may be forfeited only if the nonuse has occurred without interruption for the statutory period.
2. The statute applies only to perfected rights. It is not applicable to rights which are in the process of being acquired.
3. It is applicable to decreed rights, as well as rights which have not been adjudicated.
4. In the absence of express statutory provisions to the contrary the law is not applicable to the use of a ditch or other means of carrying water, but merely to rights to the use of water.
5. There may be abandonment or forfeiture of part of a right.
6. Upon abandonment or forfeiture of a right, the water subject thereto reverts to the public.

The question then arises: Upon abandonment or forfeiture of a water right does the water subject thereto accrue to the benefit of subsequent appropriators, or does it, by operation of law, become unappropriated public water subject to appropriation by the first person who files after the water has reverted to the public?

According to Hutchins,

> . . . upon abandonment of a water right, the water to which it was formerly entitled reverts and remains in the stream as part of the public water of the State . . . Some of the decisions have stated definitely that the water then becomes available to existing appropriators in the order of their priorities . . . It has been stated that there is no such thing as abandonment to particular persons, or for a consideration, and that the right once abandoned cannot be revived by a sale. (19)

Skeen states,

> . . . the water subject to a right which has been forfeited may be used by subsequent appropriators in the order of their priorities to augment the supply available for their unfilled rights. [The] theory seems to be in keeping with the fundamental doctrine that rights must be filled in the order of their priorities and has been adopted by the courts and the text writers. (2 Kinney on Irrigation and Water Rights Sec. 1117, p. 2016.)
>
> It is my conclusion, therefore, that water previously subject to rights lost by abandonment or forfeiture, inure to the benefit of subsequent appropriators in the order of their priorities before any water can be appropriated and used by a new applicant. (39)

The second question to be answered is: Do nonuse statutes apply to cases in which water subject to the owners right do not, during the statutory period, reach his point of diversion . . . because of unlawful diversion by upper or subsequent appropriators?

In a New Mexico case the court held, "that the lower appropriator was not at fault, but he was at all times ready and willing to put to beneficial use, and that the right was not forfeited. (New Mexico Products Company vs. New Mexico Power Company 42 N. M. 311 77 p. (2d) 634.)

The Utah court held that the statute is unapplicable to a case in which one is deprived of his use of water by reason of the wrongful use of another (Hammond vs. Johnson 94 Ut 20, 66 Pac (2d) 89, 1937: 94 Ut. 35, 75 Pac (2d) 164, 1938.)

Commenting on this, Hutchins says,

> . . . the policy of extending the rule to cases in which the water is intercepted by others upstream, without right, is

> questionable; for in such cases the injured claimant has a right of action to enjoin the interruption to his use of water, and if he fails to take the necessary steps to protect his interests it can scarcely be said that he is without fault in failing to make the adequate remedy which the law makes available. (19)

Again from Harding: ". . . continuous waste would be evidence of lack of beneficial use which might result in the reduction of the right on that ground." (16)

Logan City would gain no advantage by proving abandonment, since the priority of its application would be inferior to all existing rights and would not allow the City to divert any additional water during the period of low flow.

Trial and decision

The case came up for trial on November 27, 1961, before the Honorable Lewis Jones, District Judge, and was continued in March 1962. As testimony was received, it soon became evident that facts concerning water use, which could only have been acquired by actual measurement, were lacking. The warning of Fortier to gather facts and not "put off . . . until litigation has begun and then attempt to render court decision upon the conflicting testimony of interested witnesses" was not heard by administrators of this generation. The engineers who served as water commissioners to the Water Users' Association were not encouraged to keep records of measurements or

to submit annual reports to the users. Neither did Logan City keep records of the flow into the pipeline from the Spring even though an adequate automatic measuring device had been installed.

The engineering aspects of the case were studied by the author, who also presented expert testimony during the course of the trial. The author attempted to determine:

1. If the water users could have experienced a consecutive five-year period in which the unlawful use of water by Logan City would have caused damage, and
2. If Logan City was beneficially using all the water it was diverting, and if the City had need for additional supplies sufficient to warrant the condemnation of irrigation water.

The reason for the first study was merely to refute the claim that the water users had abandoned or lost by forfeiture any of the water Logan City was unlawfully diverting. It is doubtful what meaning that abandonment would have if upheld because no particular water user was singled out as having abandoned water and since all users involved have equal priorities the redistribution of the abandoned water in order of priority would end up with all users receiving back the same amount that was taken! The fact that Logan City, being an upstream user, was diverting water wrongfully was not considered an important defense because the water users had certainly not been diligent in protesting this

use with something more than verbal complaints.

The chart previously shown on consumptive use, Figure 15, shows that the demands of irrigators diminish rapidly after August 15 each year. By that time small grains have been harvested, alfalfa is ready for third crop cutting, and potatoes and small truck crops are almost mature. Pastures, orchards, and sugar beets still need irrigating, but for the most part, serious damage would not occur if some upper appropriator unlawfully diverted 5 percent to 10 percent of the total river flow, leaving 90 percent to 95 percent of the stream for the use of the lower users. Damage could occur if extra water were diverted during the earlier months of the irrigation season, however. Rains occurring during the last month of August would tend to reduce the damage, even though the measured precipitation was not great. The cooler temperatures and cloudy weather associated with these late summer storms reduce transpiration and the demand on the river system.

Under the decree Logan City was entitled to 10 cfs until the river flow dropped to 230 cfs; then the right diminished with the diminishing flow of the river. The maximum amount that Logan City was diverting was 20 cfs, which means that whenever the consumptive demand dropped below 240 cfs there would be a possibility of damage to the water users. In a normal year this period probably occurs between June 15 and August 15. If it can be shown that the river flow exceeds this amount

at least once in every consecutive five-year period it rules out the possibility of damage being caused by unlawful diversion and hence abandonment or forfeiture by reason of nonuse.

A series of hydrographs for each year from 1947 until 1961 have been drawn and the "critical period" superimposed on the chart. As shown in the summary in Table 12, no five-year period existed when such forfeiture could be claimed.

Logan City lacks basis for condemnation

One of the basic tenets of the appropriation doctrine is that "beneficial use" is the basis, the measure, and the limit of right. Waste of water constitutes "nonbeneficial use," and, if continued for the statutory period, could result in loss of a right. It logically follows that new rights could not be initiated unless a need and an ability to use the water beneficially exists. This same principle could apply to acquiring water rights by condemnation. An indiscriminate use of the condemnation power without having a basic need for additional water would not be allowed by the courts. Neither would the courts allow a water right to be condemned if an alternate source of water could be provided, which would not damage existing appropriators. For this reason, a study was conducted to determine whether Logan City was actually using beneficially all of the water it was wrongfully diverting.

Table 12. Date rationing begins.

	Date rationing begins	Do demands exceed flow?	Notes
1959	July 24	Yes	
1958	Aug. 11	No	Until rains begin on 15th
1957	Aug. 23	No	Rains began 22nd
1956	Aug. 13	Yes	For 10 to 15 days
1955	July 27	Yes	
1954	July 10	Yes	
1953	Aug. 20	Yes	For 5 to 10 days
1952	Sept. 2	No	
1951	Sept. 14	No	
1950	No rationing	No	
1949	Aug. 12	Yes	For 10 days - rain on 23rd
1948	Aug. 20	Yes	For 5 to 10 days
1947	Aug. 11	Yes	For 10 to 15 days
1946		No	Pipeline too small to exceed right

The water diverted at DeWitt Springs flows by the pipeline to a concrete reservoir located on one of the bench terraces just east of Logan City. The reservoir spillway dumps directly into the canal of the Logan, Hyde Park, and Smithfield Irrigation Company. It was the practice of Logan City to maintain a constant level in the reservoir in order to preserve the proper operating pressure in the distribution system near the reservoir. In other words, the reservoir would spill unless the outflow to the users was equal to or greater than the inflow to the reservoir. The inflow to the reservoir is measured, except for some small use by homes in Logan Canyon. There is no measured outflow from the reservoir, either to the user or to the spillway. The only measuring devices on the outflow side of the reservoirs are the individual meters on each service connection. These are totalizing meters which record the total water passing the meter. They do not record instantaneous flow rates. The meters are read three times during the year, once in April, once in August, and once in December.

The meter readings for five individual years were examined and tabulated to give the total water use for each year and for each four-month billing period within each year. A comparison was then made with the total water allowable to the City under the Kimball decree. These figures are given in Table 13 and are shown graphically in Figure 18. In each year there were a number of service connections which were not metered. An estimate of this amount based on the average use per connection or upon the charge made by the City to such an

Table 13 Water used, allowed, and diverted by Logan City--a comparison.

Year	Period	Used[a]	Allowed	Shortage	Diverted	Excess Diversion
1949	J-Ap	580	2328	-	-	-
	M-Au	943	2314	-	3174*	860*
	S -D	813	1942	-	-	-
1953	J-Ap	516	2328	-	-	-
	M-Au	1143	2345	-	4797*	2452*
	S -D	1084	2181	-	-	-
1956	J-Ap	533	2328	-	-	-
	M-Au	1510	2314	-	4797*	2483*
	S -D	1106	2059	-	-	-
1959	J-Ap	557	2328	-	-	-
	M-Au	1600	2212	-	4797*	2585*
	S -D	1059	2157	-	-	-
1961	J-Ap	748	2328	-	-	-
	M-Au	1811	1762	49	4090	2328
	S -D	1273	2017	-	-	-

*Prior to 1961 no measurements of water actually diverted are available. The figures used here are estimates based on the capacity of the pipeline.

[a]Determined by tabulating all meter readings for period indicated.

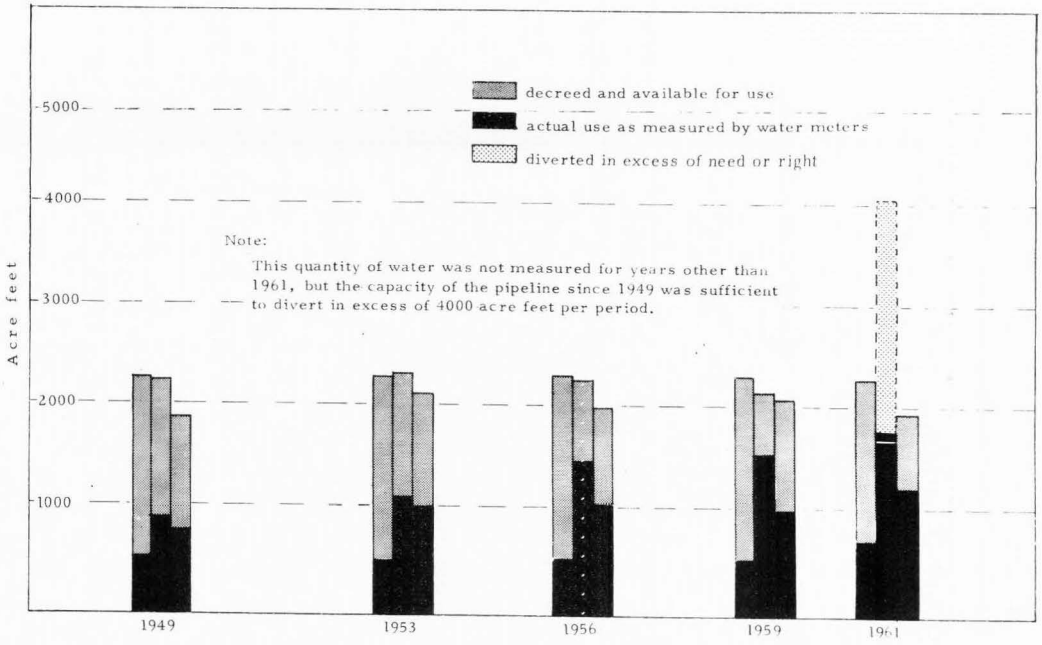

Figure 18. Logan City's actual water use as compared to the water allowed by the "Kimball" decree.

account was made. The discovery was also made that several water deliveries were not metered and did not appear in the billing record. This "free" water generally included use by churches, city parks, or other city facilities, including fire hydrants and drinking fountains. An estimate has been made for these uses as follows:

1. Logan City Cemetery. Approximately 45 acres irrigated until very recently from the Logan, Hyde Park, and Smithfield Canal. Logan City owns 81 3/4 shares in the irrigation company, which in 1961 entitled them to 389 acre-feet of water. For the past several years (less than eight) Logan City has not taken water from the canal but has diverted directly from the reservoir. It is estimated this use during May to September was 144 acre-feet.
2. Mountain Air Park. Approximately eight acres near the mouth of Logan Canyon. This park was established in 1950 and is irrigated from the city system. The seasonal use for this area is about 26 acre-feet.
3. Adams Park. About five acres originally irrigated from waters of the Logan Northern Irrigation Company, now sprinkled by city system. Seasonal use is about 16 acre-feet. Logan City's rights under the canal would have amounted to less than this in 1961.
4. Temple grounds and Tabernacle grounds. About 20 acres irrigated from city system. Seasonal use about 64 acre-feet.

5. Cache County Fairgrounds. About five acres were planted to grass in 1960 and are irrigated from city system. Seasonal use about 16 acre-feet.

6. Diesel plant. To cool the diesel engines, it takes 1.05 cubic feet of water per KWH produced. In 1961 during May through August, 1,320,000 KWH were produced and 30 acre-feet of water used. Peak use occurs during the winter. The total for 1961 was 132 acre-feet.

7. Street flushing. This is considered a minor use, not over four acre-feet per year.

The interesting result of the study of meter service connections was that in only one year, 1961, did Logan City's average use actually exceed its allotment! Average use, though, for a four-month period, does not give an indication of what peak daily flow rates were required to meet the highest demand. There were undoubtedly short periods when daily use rates exceeded the allotted flow. Unfortunately, there are no records to evaluate them. What is needed is sufficient storage to carry over winter water to meet the summer peaks. (This was essentially done by constructing wells to utilize underground storage.)

Evidence that the water users were not diligent in protecting their rights was also presented to the court. At no time, until the 1963 suit was initiated, did the water users raise more than a verbal protest to the wrongful diversion by Logan City; there was not even a demand by

the water users to measure the flow of DeWitt Springs to determine whether the City's right was being exceeded. The proper use of a water commissioner who was required to produce a published record of each year's measurements would have been sufficient to avoid litigation.

Findings of fact

The findings of the court are expressed in the following excerpts from the "Findings of fact and conclusion of law," (46) filed July 8, 1963.

> . . . That between the years 1922 and 1939 (both years inclusive) Logan City diverted through its pipelines and applied to beneficial use, a constant flow of 10 cfs of water from DeWitt Spring, during the irrigation season, which was hostile, notorious, adverse, uninterrupted, and continuous, and which was asserted under a claim of title with the knowledge and acquiescence of each and all of the named water companies having rights on the Logan River and the Utah Power and Light Company.
>
> During the period from 1947 to and including 1961, Logan City diverted from DeWitt Spring into its pipeline to the full extent of the yield of the Spring and capacity of its pipeline (maximum 19.5 second feet). A portion of the water so diverted overflowed at times from the Logan City reservoir into the Logan, Hyde Park, and Smithfield canal. That, during the years 1950, 1951, 1952 and 1956, the flow of Logan River was at all times sufficient to fill the needs of the defendants under weather conditions prevailing, and since the enlargement of the Logan City pipeline in 1947, there is no evidence of a continuous period of five years during which the defendants or any of them ceased to beneficially use water to which they were entitled. There is likewise no evidence that the defendants or any of them intended to divert, forsake, or abandon any water right or any part thereof.
>
> There is no unappropriated water in DeWitt Spring to Satisfy Application No. 32383 and no evidence was adduced to meet conditions for approval of said application required by Section 73-3-8 U.C.A., 1953.

Conclusion of law

The following conclusions were listed by the court:

> 1. When the flow of Logan River measured as provided in the Kimball decree is 220 second feet or less, Logan City is, at all times, entitled to divert and use 10 second feet of water in lieu of the flow specified in Schedule "A" of said decree, and Logan City is entitled to a decree modifying said Schedule "A" by inserting therein figure "10" in lieu of the present figures under each of the headings 120, 130, 140, 150, 170, 180, . . . 220, and decreasing the awards of the other listed in Schedule "A" in a proper proportion.
>
> 2. The defendants are entitled to a decree permanently restraining and enjoining the plaintiff from diverting from DeWitt Spring water in excess of the Logan City water rights set out in the Kimball decree as modified in accordance with the conclusion of Law No. 1 thereof.

and

> 6. The trial of the issue of the fair market value of the water condemned in Civil No. 9370 is reserved pursuant to the stipulation of the parties hereto . . ."

Decree

The final decree signed by Judge Jones on July 8, 1963, awarded to Logan City a constant flow of 10 cfs with a priority superior to all other rights, but the decree perpetually restrained Logan City from exceeding this amount. A new distribution schedule based upon this decree is shown in Figure 19, and Table 14.

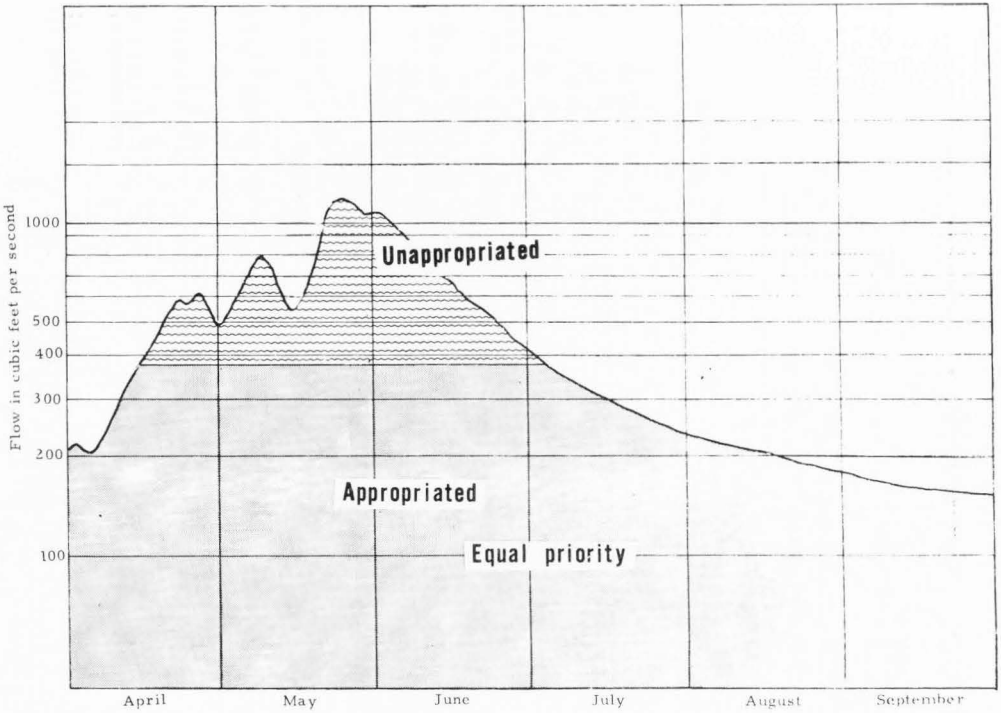

Figure 19. Extent of water appropriated under the "Kimball" decree distribution schedule.

Table 14 Revised Schedule "A" Kimball Decree July 8, 1963

Flow in Logan River CFS

Appropriator	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390	400
Logan City	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Logan, Hyde Park & Smithfield	20.2	22.4	24.6	26.9	29.1	31.4	33.6	35.8	38.1	40.3	42.5	44.8	47.0	49.4	51.5	53.7	56.0	57.3	59.5	59.5	70.8	75.3	79.8	84.3	88.8	93.3	97.8	102.3	103.2	109.3	116.0
Logan, S. Fields	22.9	25.4	27.8	30.4	33.0	35.5	38.1	40.6	43.2	45.7	48.2	50.8	53.3	56.0	58.4	61.0	63.3	65.0	67.5	67.5	76.8	79.3	79.8	84.3	88.8	93.3	97.8	102.3	103.2	106.1	109.4
Logan, Utah &	0.6	0.7	0.7	0.7	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.6	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.5	2.5	2.5
Providence-Hyde	3.2	3.5	3.9	4.3	4.6	5.0	5.3	5.7	6.0	6.4	6.8	7.1	7.5	7.9	8.2	8.6	9.0	9.2	9.5	9.5	10.1	10.7	11.4	11.9	12.6	13.1	13.9	14.6	14.7	14.7	14.7
8th Ward Diversions	41.7	44.9	48.2	51.4	54.6	57.9	61.2	64.4	67.6	70.9	74.1	77.3	80.6	83.8	87.1	90.3	93.0	97.7	102.4	107.0	111.7	116.4	121.1	125.8	130.4	135.1	139.8	144.5	145.4	147.4	149.3
Logan Island	6.9	7.7	8.4	9.2	10.0	10.7	11.5	12.3	13.0	13.8	14.6	15.3	16.1	16.9	17.7	18.4	19.2	19.6	20.4	20.4	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	20.9	21.4	21.4
7th Ward	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.0	2.0	2.0
Hyde Park & Logan Northfield	14.8	16.5	18.2	19.8	21.4	23.0	24.7	26.3	28.0	29.6	31.3	32.9	34.6	36.2	37.9	39.5	41.2	42.1	43.8	43.8	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	44.7	45.0	45.0
Thatcher Irr. Co.	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Logan Northwest Field & Benton	19.5	17.3	19.0	20.7	22.4	24.2	25.9	27.6	29.3	31.1	32.8	34.5	36.2	38.0	39.7	41.4	43.1	44.1	46.0	46.0	47.6	47.6	47.6	47.6	47.6	47.6	47.6	47.6	47.3	47.7	47.7
Southwest Field	5.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.8	7.2	7.6	8.0	8.4	8.8	9.2	9.6	10.0	10.3	10.7	10.7	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.8	10.9	10.9
Logan Cox Pasture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.7	8.9	8.9
Providence-Pioneer	1.4	1.5	1.7	1.9	2.0	2.1	2.3	2.5	2.6	2.8	2.9	3.1	3.2	3.4	3.5	3.7	3.8	3.9	4.0	4.1	4.3	4.4	4.5	4.7	4.8	4.9	5.0	5.2	5.4	5.5	5.7
Hyrum Grocery	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Power Rights																															
Utah Power & Light	69.8	77.6	85.4	93.1	100.9	108.6	116.4	124.2	131.9	139.7	147.4	155.2	163.0	170.7	178.5	186.2	194.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Central Milling	22.7	25.1	28.0	30.4	33.0	35.9	38.1	40.5	43.1	45.7	48.1	50.8	53.1	56.0	58.3	60.9	63.3	63.9	66.2	68.5	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
Crowther Bros.	19.1	21.3	23.5	25.8	27.6	29.9	32.0	34.1	36.1	38.3	40.4	42.7	44.7	47.1	49.0	51.1	53.1	53.6	55.5	57.4	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0

WATER EXCHANGE AGREEMENT

The decree was purposely not signed immediately after the trial in order that the plaintiffs and defendants might work out some type of agreement concerning the value of the condemned water and to effect an agreement by which Logan City could exchange well water for water from DeWitt Springs. In the event that no agreement could be made the delayed signature would permit either party time to appeal the decision to the Supreme Court.

At the time the suit was filed and it became evident that Logan City would be restrained from diverting more than 10 cfs from DeWitt Spring, the City filed an application with the State Engineer to appropriate water from the underground reservoir by means of four deep wells. The first well was completed and tested during the summer of 1962. The well produced eight second feet of acceptable water. The second well completed in 1963 produced 11 second feet of water, and the other two wells, completed in 1964 produced 15 and seven second feet, respectively. This gives to Logan City a potential municipal supply of 51 second feet, including the 10 cfs from DeWitt Springs.

Instead of pumping directly into the distribution system of the City, the wells have been so located and designed to pump into the canals of the water users. This gives the city the ability to replace the water it diverts from DeWitt Spring over and above 10 second feet with an

equal amount from the wells. With this ability an exchange agreement was possible.

A simultaneous exchange; that is, operating the pumps to produce the exact difference between 10 second feet and the flow into the pipeline from DeWitt Spring during the period when the pipeline carries more than 10 second feet, was considered inefficient and wasteful. It was therefore agreed to exchange water on a volume basis to be replaced upon demand by the water users. This in effect allows the water users to store water in the underground reservoir and to retrieve it when it is most needed.

A simple year by year accounting system was agreed upon whereby the respective volumes of water used by each party are examined at the end of the year and the party which exceeds its allotment compensates the other party at the rate of $4 per acre-foot. The agreement is workable, easily managed, and presents about equal benefits to both parties.

Condemnation suit

With the ability and capacity to supply its municipal demands entirely from well water, Logan City had no reason to condemn the water in DeWitt Springs. The City was obligated, however, to pay for the water it had used during the course of the trial and until the well-exchange agreement had been signed. Rather than determine the fair market value of such water in court, the parties agreed to accept the

recommendation of a committee of engineers appointed for that purpose. Consequently, the author met with A. A. Bishop and Winn Templeton to agree upon a fair price for the water. The recommendation of the committee was accepted, and Logan City paid the water users $15,746.50 as payment in full for the water condemned during the legal proceedings.

SUMMARY AND EVALUATION

The changes that have taken place in the management and control of water resources in Cache Valley and Utah have come about because of the pressures of progress. From the infant settlement, struggling for survival in a war against nature, to the varigated complex of city life today, the democratic institutions of free society have been able to meet and solve each water resource problem as it has arisen.

The first settlements were faced with problems that could only be solved on a united community basis. The law therefore permitted the civil authority to control all of the natural resources in the area, and to grant "rights" and "privileges" to those individuals best qualified to develop the resources for the good of the public. Irrigation ditches, diverting works, and mill sites were all controlled by elected court officials. As the population grew and society became more complex, the need for community effort lessened. An individual could establish a home and seek a source of livelihood without the same dependence upon his neighbor as was experienced by the first settler. The ditches were already dug, the fields were occupied and planted, and it became necessary for the new arrival to "bargain and sell," or buy as the case may be, in order to find occupancy in the new settlement. As life became more complex so did the task of apportioning water privileges.

Today, the average citizen has little "awareness" of the water right situation which surrounds him. Life has become so complex that the average citizen has no time to worry about the development and preservation of water resources; nor does he have opportunity to work shoulder to shoulder with his neighbor in important public work projects. The comforts he enjoys, like fresh water delivered to his faucet, he takes for granted. This type of society has a different water apportionment problem.

The evolution of our present day water resource apportionment laws has been orderly and progressive. The methods and techniques of administration have been wisely conceived. The laws that preserve and protect the water user have been tried and tested. There may be weaknesses in the system as there are weaknesses in men, but like men the system is dynamic and constantly subject to change. Only time will tell if future changes will mean continued progress.

There are several important lessons to learn from this study of water rights on Logan River. The first and most basic tenet to infuse upon our minds is the philosophy that water is a public resource and that all uses of water are public uses. This means that development of water as a resource must be controlled by legislative law, which protects individual liberties, and at the same time protects the resource against waste and misuse. This philosophy, adopted in the beginning of arid agricultural settlement in Utah, led directly to the doctrine of

acquiring water rights by appropriation. The methods employed by administrators to accomplish the purposes envisioned in this philosophy have varied through the years and have been modified by the pressures of each generation.

In the early period of settlement the probate judge of each county was given jurisdiction over water resources, and each prospective user had to submit an "application" (petition) to the county court. There were no precedents, rules, or guidelines which the court could use to measure the worth of each application and so the success of the method was principally a test of the wisdom of the probate judge. It is doubtful if this method could have succeeded in any other atmosphere than that found in the Mormon pioneer settlements, where the people respected good leadership and shared a common religious philosophy.

As the new communities grew and expanded problems of administration also grew. Differences of opinion between appropriators were, in the early period, solved by the ecclesiastic court. The coming of non-Mormon settlers, however, placed more of the judicial responsibility upon the probate judge until finally the legislature eased the judge's burden by placing the responsibility upon the three selectmen. The selectmen were made "ex officio water commissioners" with three major responsibilities: (a) to record and preserve written evidence that water rights had been initiated on the date and to the extent claimed by each appropriator; (b) to receive applications for new water rights and to

judge and rule upon the worthiness of each; and (c) to form a jury of three to "hear and decide" disputes between appropriators.

Statehood brought many changes in governmental structure. The office of probate judge, along with the selectmen, was abolished and a commission form of government established in each county. The judicial structure was also changed. A series of district courts replaced the county court. This move separated the judicial powers from the administrative powers which had been held simultaneously by the probate judge. As a result of these changes there was no responsible administrative person designated to receive applications for water rights. In fact, this was the beginning of a short period in Utah history (1898-1903) when water rights were not initiated by application. The new state law required a new appropriator to "post notice" in the proper places as the only requirement to initiate a right. No provision was made for anyone to judge the feasibility of the appropriation or to determine if unappropriated water existed or if the intended use of water was in the best public interest. This law reflects the influence of the mining industry upon the legislators who tried to treat water as a resource fixed in time and space like a mineral deposit. Fortunately the "error of their ways" was soon discovered and a new procedure developed and introduced.

The new method maintained the separation of judicial and administrative responsibilities found in the new state and county governments. The State Engineer was given the responsibility to accept applications

for new appropriations, and to determine the physical facts necessary to judge the worthiness of the application. To the district court was given the responsibility to "hear and decide" any disputes arising between appropriators. The rules and regulations that guide the State Engineer and the district court were defined by the State Legislature.

A second lesson to learn from this study concerns the tools developed by the water users to distribute a schedule of water rights based upon priorities (the first in time is the first in right). The workability of the schedule was demonstrated by tabulating the rights as a function of total flow in the river. The resulting table permitted every appropriator to see at a glance how much water he could expect. With proper measuring devices the watermaster of each company could "check the distribution and report with intelligence the actual condition on his canal."

The schedule was made more workable and useful when the water users agreed to accept a common priority. Actually a schedule can be made to work with any number of priorities, but the market value of each water right is greatly enhanced by being of equal dignity with all other water rights. The schedule is also more easily constructed if all rights have one priority.

The value of the schedule as a distribution tool was recently recognized by State Engineer Wayne D. Criddle, as he reported in the 31st biennial report for the period 1956-58.

> The compilation of a tentative priority schedule and the submitting of the schedule in the form of a proposed determination to the district court has been found very useful. It assists the State Engineer's office, the water users, and the court to better understand the rights on a stream. It helps settle disputes on streams prior to the expensive printing of a proposed determination. It also gives an opportunity to administer the water rights as determined in the priority schedules on a trial basis. The water users can examine the priority schedule and the relative position of his rights with others so that any impractical determination or errors that are noticeable can be corrected prior to the adoption of a final decree.

The schedule is also a very useful tool in determining if the physical factors affecting the river flow coincide with the judicial decree.

A third lesson to be learned from this study is the necessity of employing a water commissioner who is an administrative assistant to the State Engineer, and empowered by the court to enforce a final decree.

The Logan River system has operated in three separate modes--(a) without a decree and consequently without a water commissioner, (b) with a decree but without a water commissioner, and (c) with a decree and with a water commissioner. In the first and second mode litigation has eventually resulted. In the first mode the water users depended upon a report which suggested a priority schedule but which was not given legal status. Even if a commissioner was employed he would have no authority to enforce the agreement. In the second mode the official document existed and could have been enforced if a commissioner were used. The lack of a commissioner allowed certain appropriators to infringe upon the rights of other appropriators and litigation was

necessary to correct the situation. Logan River does not have a long history in mode three. The elements are present, however, to effect orderly distribution and avoid conflict which results in litigation. The effectiveness of this system depends to a large extent upon the soundness of the decree and the diligence of the water users to detect irregularities of practice as may show up in the commissioner's report. In the case of dispute reaching the courts, a factual record exists so that intelligent decisions can be made.

Engineers are sometimes prone to speak despairingly about the legal profession and to avoid, if possible, the submission of water disputes to the courts. It may be that some water decrees have been unsound and unworkable. This may be as much the fault of the engineers as the court. Engineering "facts" can sometimes be made to appear contradictory. If this happens the only recourse for the court is to judge between the two contridictions. A court decree has no jurisdiction over nature. If the natural phenomena are not properly understood by the engineers nor presented in understandable terms to the court, errors in judgment are apt to be made. The causes of long debates in court proceedings, though, are usually not engineering facts, but the social significance of such facts in altering the economy, or social structure of the political or social unit.

One of the big objections to legal conflict is the cost. How much the various decrees have cost the water users is not known. Since the

Table 15 Cost of Civil Action-Logan City vs. Logan River Water Users Association.

Logan City	
Engineer fees	$ 810.00
Lawyer's fees	$8,372.91
Court Recorder	$ 105.60
Sub-Total	$9,288.51
Judgement-Condemnation cost (payable to Water Users Assoc.)	$15,746.50
Total	$25,035.01
Logan River Water Users Association	
Engineer fees	$2,164.13
Lawyer's fees	$2,929.21
Total	$5,093.34

Note: Logan City made an additional investment in four deep wells. If the wells had not been drilled Logan City would have had no bargaining power to cease condemnation proceedings. To purchase an exclusive right to use the total output of Dewitt Springs could have cost considerably more than the cost of the wells. The four wells were drilled and equipped at an approximate cost of $100,000.

establishment of the State Engineer's office in 1903, cost has been incurred for:

(a) the hydrographic survey of 1912

(b) the Barber-Swendsen report

(c) the Call decree

(d) the Kimball decree

(e) the amended decree of 1926

(f) the amended decree of 1963

Cost figures available for the 1963 conflict are as shown in Table 13 (37).

This is actually a small cost when one considers what might have happened if an alternate source of water was not provided by drilling the deep wells. With no water to exchange, Logan City would have been obligated to continue the condemnation suit. It is highly probable that the fair market value of the water would be much higher than agreed upon by the Logan River Water Users' Association and Logan City. Without wells the cheapest alternate would be to import water from some storage project such as the Bear River Project proposed by the U.S. Bureau of Reclamation. Municipal water under the project would cost at least $20 per acre-foot. The water condemned would then have an annual value of about $30,000 which would represent a lump sum payment of one million dollars invested at 3 percent interest. The four wells constructed by Logan City cost approximately one-tenth this amount, or near $100,000.

It is true that wells could have been drilled and agreements negotiated to exchange water without having a legal contest. Court trials are "hostile" proceedings and human emotions are involved. The very fact that emotions are involved means that negotiations and agreements may not be effected. Failure to agree can often be overcome if pressures are sufficient to induce compromise. This is one result of the court trial.

It has been stated that a decree is necessary for adequate water distribution. As changes in use occur it is sometimes necessary to change decrees. This can only be done by the court. In this respect the court action should not be feared, and will not be feared if viewed in the proper perspective of its being the essential third part of a free democratic procedure. There must be an agency to "hear and decide." And when this occurs there must be adequate engineering facts available so that the decision rendered will be realistic and workable as well as just.

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