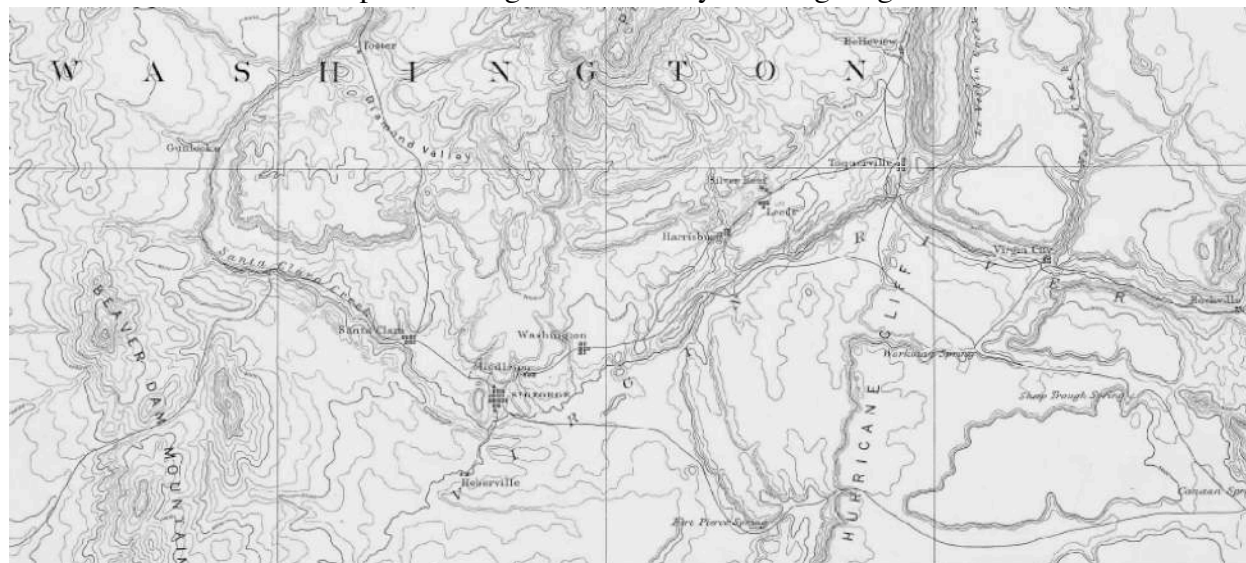


Utah and the West

Mormon Settlers were first Anglos to divert streams for irrigation. The area of land “under ditch” was a measure of the prosperity of early Mormon settlements.

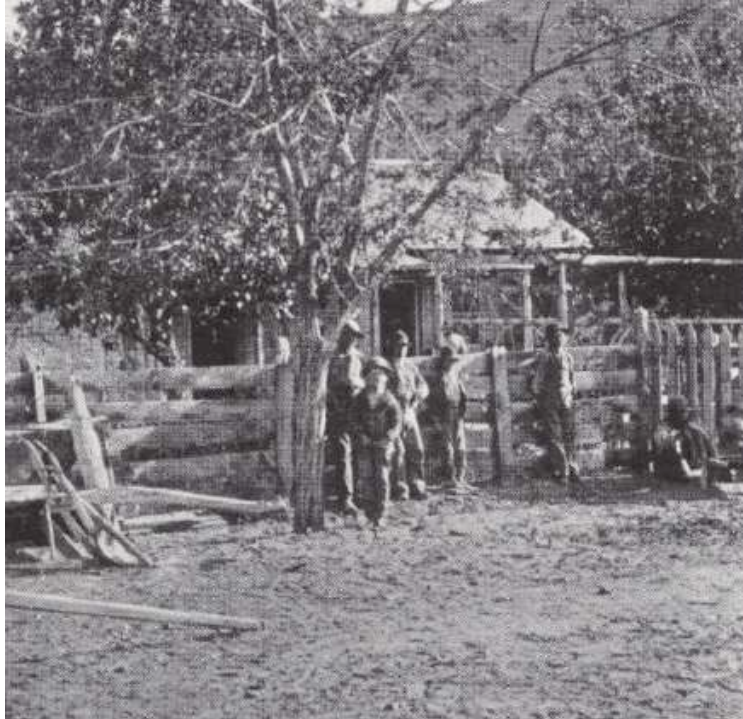


1878 Map of the Virgin River Valley showing irrigated areas



1891 USGS Map of Washington County (J.W.Powell)

History of Water Conservation
Utah and the West

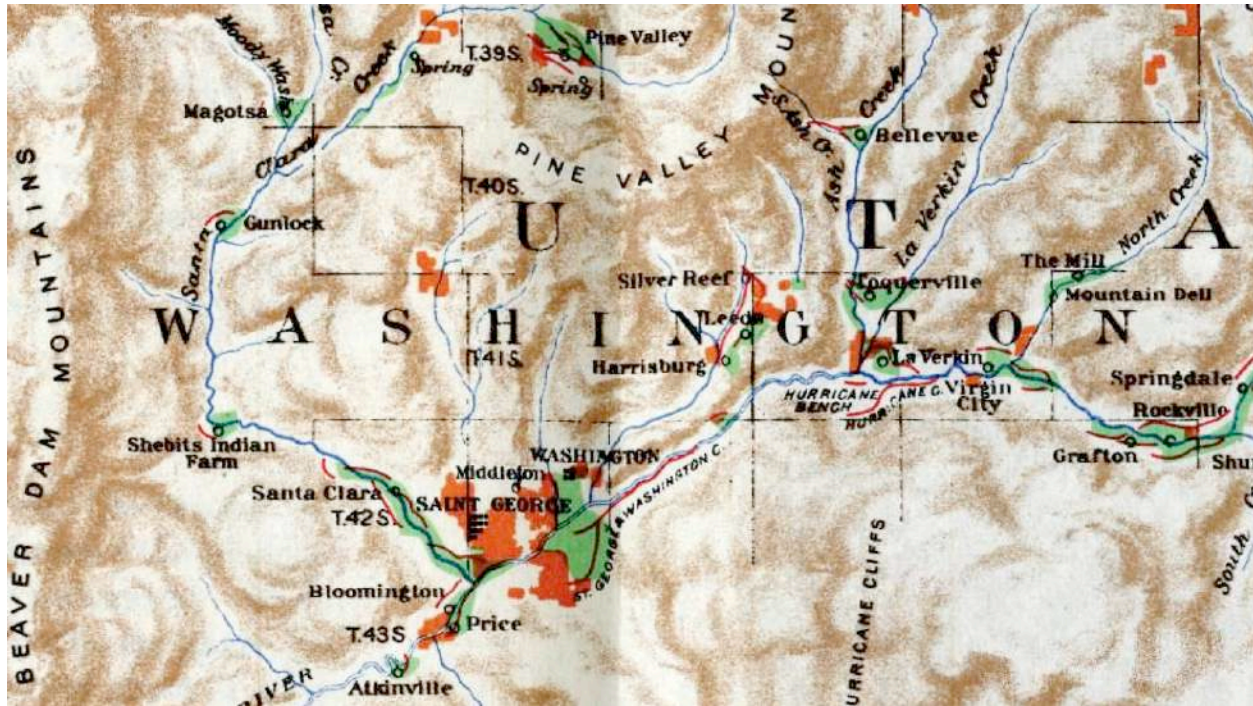


1873 photo of Mormon home in Virgen City



1903 photo of a Virgen City yard

History of Water Conservation
Utah and the West



1902 Map of Irrigated Areas (Elwood Mead)

1	Zion Ditch	Above Springdale	41
2	Flanigan Ditch	Above Springdale	7
3	Reusch Ditch	Above Springdale	7
4	Windows Ditch	Above Springdale	40
5	Crawford Ditch	Above Springdale	40
6	Flanigan Ditch	Above Springdale	120
7	Springdale Upper Ditch	Springdale	96
8	Springdale Lower Ditch	Springdale	64
9	Shunesburg West Ditch	Shunesburg	15
10	Shunes Creek Ditch	Shunesburg	7
11	South Creek Ditch	Shunesburg	7
12	Rockville Town Ditch	Rockville	235
13	Rockville South Ditch	Rockville	52
14	Dalton Ditch	Rockville	6
15	Grafton Town Ditch	Grafton	70
16	Grafton Lower Ditch	Grafton	84
17	Duncan Ditch	Above Virgin City	4
18	Upper Farming Land Ditch	Virgin City	52
19	Farming Land Ditch	Virgin City	91
20	Virgin City Upper Town Ditch	Virgin City	32
21	Virgin City Lower Town Ditch	Virgin City	44
22	Lee & Spendlove Ditch	Virgin City	10
23	Wright and Isom Ditch	Virgin City	7.5
24	Hurricane Canal	Hurricane Bench	not determined
25	La Verkin Canal	La Verkin Bench	400
26	D. Spillsbury Ditch	Above Ash Creek	8
27	L. Savage Ditch	Above Ash Creek	6
28	Pollock Ditch	Above Wash. Dam	55
29	Prince and Wilkinson Ditch	Above Wash. Dam	55
31	St. George/Washington Canal Above	St. George	2175
32	Jarvis Ditch	Above St. George	200
33	Bloomington Ditch	Bloomington	190
34	Price Ditch	Price	184.5
35	Atkinville Ditch	Below Price	120
			4531

History of Water Conservation

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surveyors wagon in the rockies 1859 albert bierstadt



temples of the rio virgin southern utah 1876 alfred lambourne



The earliest United States government expeditions always included surveyors, photographers and often artists. Among these expeditions were those of Lieutenant Joseph C. Ives (Topographical Engineers 1857, 1858) who took a steamboat up the Colorado and Professor John Wesley Powell (Smithsonian Institution 1869, 1870, 1871, 1872, 1873) whose first expedition came down the Colorado in boats.

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zion canyon 1903 frederick dellenbaugh



zion valley south utah 1916 thomas moran



The earliest images (photographs, sketches, watercolors, paintings) of the Colorado and its tributaries emphasized the awesome grandeur of its peculiar topography including dramatic sunsets. A few decades later, the verdure of the irrigated landscape finds a place in the work of these pioneering artists.

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cloud world 1925 maynard dixon



red butte with mountain men 1935 maynard dixon



In a few more decades, artists would again emphasize, albeit in more abstract ways, the geology, topography and “western” skies. The agriculture depicted is ranching (rather than farming) with cowboys and indians (rather than farmers) portrayed as diminutive intruders on the timeless landscape. This vision of the American West as a place “too large” to be “settled” is now deeply embedded in our collective subconscious.

st. george 1903 panorama detail george edward anderson

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This 1903 photograph by George Edward Anderson depicts the extent to which the Mormon



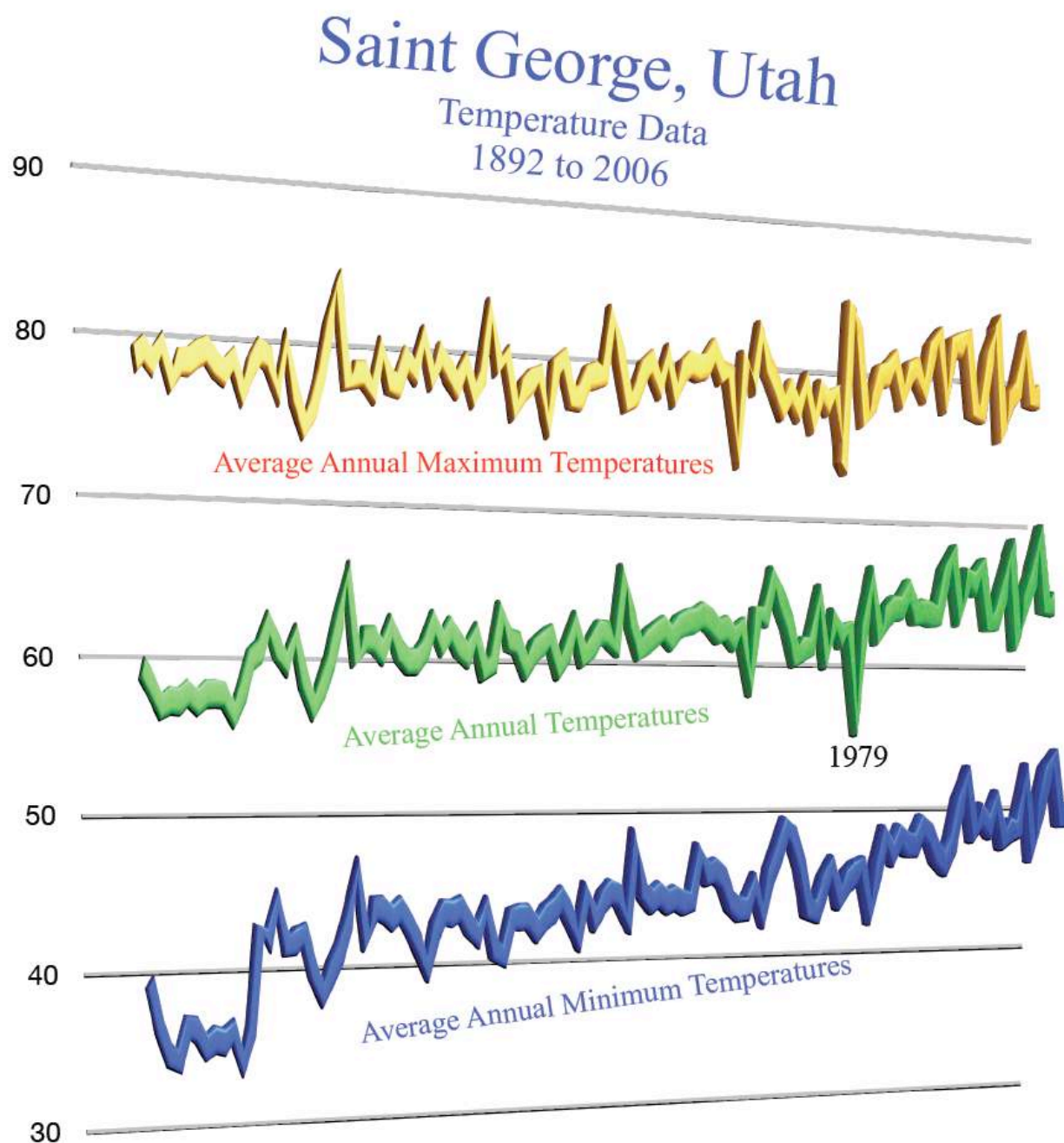
colonists were successful in transforming the desert into a veritable garden with even the smallest patches of irrigated land under cultivation.

History of Water Conservation
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By 1915, St. George had a college, a gymnasium, a library, a hospital, stores on Main Street and the beginning of an economy. In 1908, there had been an oil boom near Virgin City. In 1909, Zion (Mukuntaweap) had been designated a National Monument with National Park status to follow in 1919. Water that had arrived (since settlement) at each town lot in ditches now came in buried wooden pipes free from the contamination of livestock although frequently still quite “muddy” and full of silt. Electric lights appeared after 1909, and indoor water closets began to replace traditional outhouses.

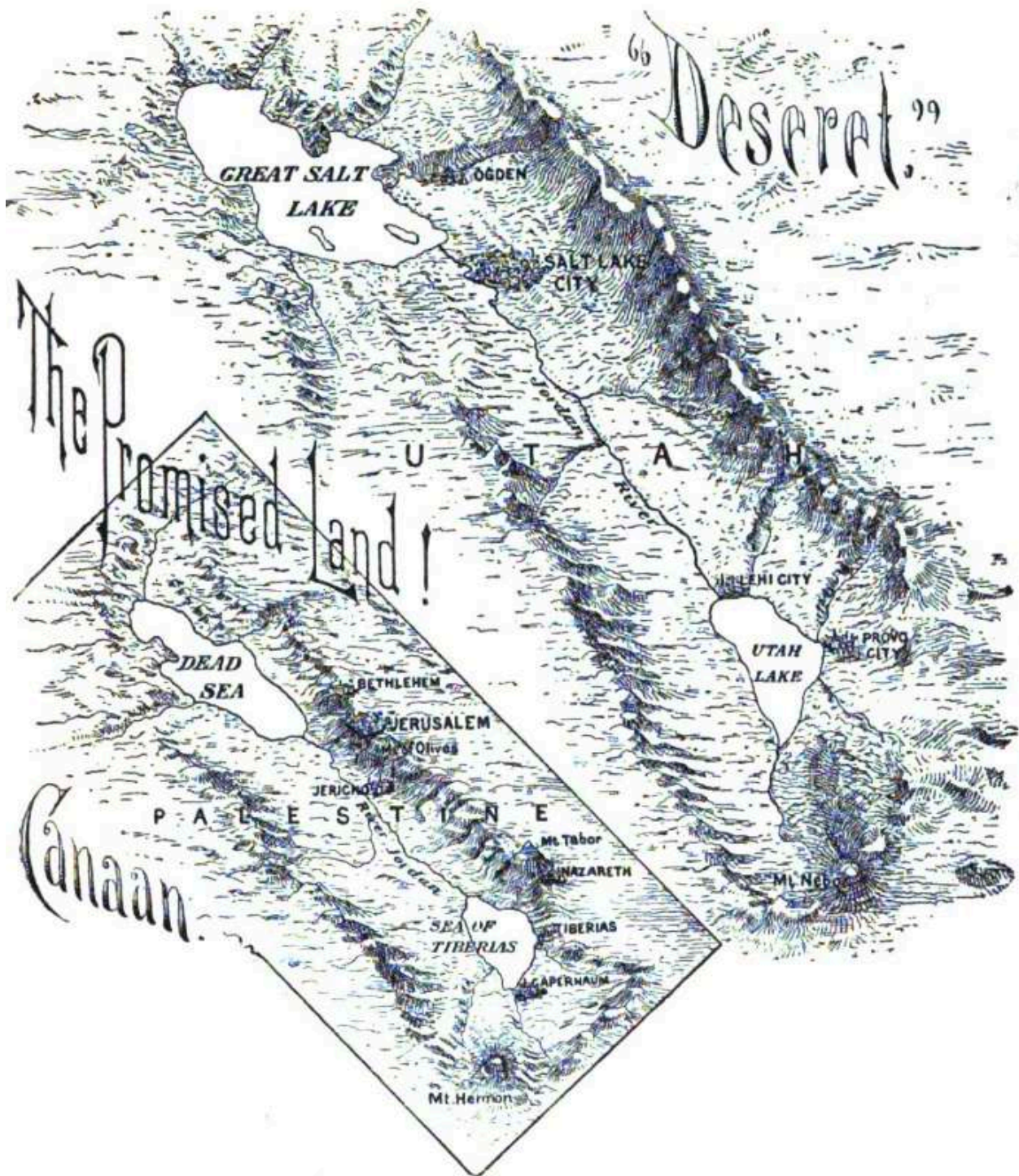
Agriculture was still the necessary preoccupation of every family, but increasingly more scientific farming and irrigation methods were demanded. As early as 1868, Joseph E. Johnson, had pioneered a variety of peach in his garden (where present day Ancestor Square is located), and by 1915, an Agricultural Experiment Station run by the State Agricultural College in Logan was operating in Washington Fields. Thomas Judd had served on the Utah State Horticulture board and would exhibit fruit from the area in the Panama-Pacific Exposition in San Francisco in 1915. Many families relied on stock raising to supplement the income derived from their irrigated land.



This temperature history (from NOAA records) provides evidence of a different microclimate in St. George during the last decade of the 19th century and the first years of the 20th century. Is this the result of the changes to St. George's local economy that occurred before 1915?

After 1979, these graphs provide evidence of an "urban heat island" that had developed in St. George increasing average annual minimum temperatures by approximately 5° F.

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“A publicist for the Rio Grande and Western Railroad noticed, while gazing at a map of the territory of Deseret -- now Utah -- a faint resemblance to the cradle of civilization. The Rio Grande and Western promptly published a map of Deseret that contained an inset map of Palestine (“The Promised Land”), calling attention to their “striking similarity”. “Follow prairie dogs and Mormons”, went a pamphlet of the Burlington Line, “and you will find good land.”

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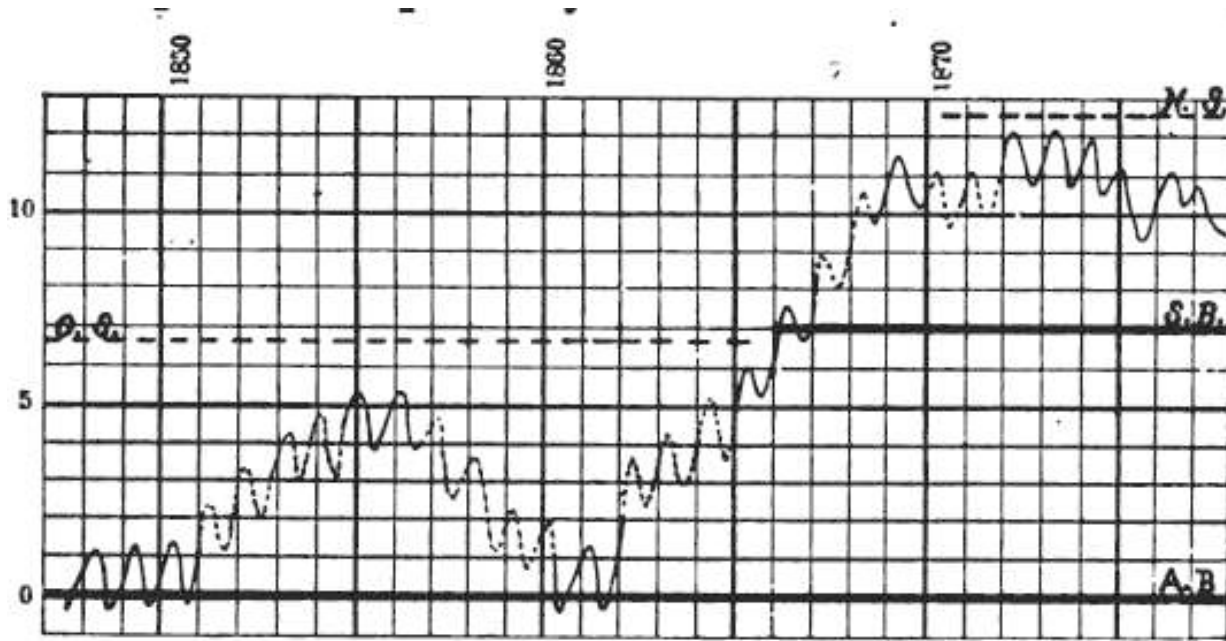


Diagram showing the rise and fall of Great Salt Lake from 1847 to 1877.

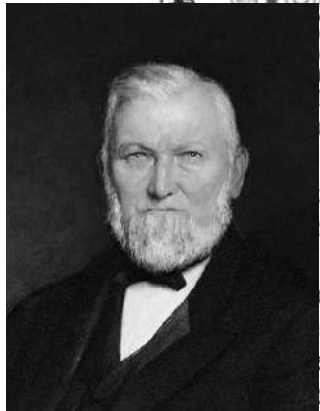
John Wesley Powell's 1879 report to Congress on the Arid Lands includes this graph showing the persistent rise of the Great Salt Lake over the thirty year following the arrival of the Mormon pioneers. He also states:

It is frequently asserted that the cultivated lands of Utah "draw the rain"; or that the prayers of the religious community inhabiting the territory have brought water to their growing crops; or that the telegraph wires and iron rails which gird the country have in some way caused electricity to induce precipitation; but none of these agencies seem to be competent. The weather of the globe is a complex whole, each part of which reacts on every other, and each part of which depends on every other. The weather of Utah is an interdependent part of the whole, and cannot be referred to its causes until the entire subject is mastered. The simpler and more immediate meteoric reactions have been so far analyzed that their results are daily predicted; but the remote sources of our daily changes, as well as the causes of the greater cycles of change, are still beyond our reach. Although withdrawn from the domain of the unknowable, they remain within that of the unknown.

By 1890 Major Powell was testifying before Congress about the values of irrigating land.

It is because of the large increment of value given to land by reason of irrigation. It is so enormous that there is no difficulty in obtaining hundreds of millions of dollars for the land's redemption. Hardly a week passes that some foreign or American investment company does not write to me asking for information. Capital is offering everywhere. You must appreciate what it means to take desert land that has little or no value and make it worth from \$30 to \$200 an acre, and after these lands have been increased thus in value, to obtain permanent right to water and make a permanent investment. The opportunities for investment and for making grand fortunes are so great that money pours into the country for the purpose.

Official Call for Third National Irrigation Congress.



By the authority of the National Executive Third National Irrigation Congress is hereby in the city of Denver, Colorado, for the seven September 3d, 1894.

To the people of the western half of the Congress presents both an urgent duty and a supreme one at this moment of extraordinary political, social and industrial revolution may well recall Macaulay's prediction, that the great changes would come with the exhaustion of our public resources. We face that situation to-day, with all its perilous possibilities. Our public lands are to be made fit for the homes of millions of men whereby this may be done, so that idle energies may be put to use, and landless citizens find homes and industrial opportunities and the opportunity of western men.



Irrigation Commissions in seventeen States and Territories, created by the last Irrigation Congress, will render reports to the convention at Denver. Upon these studies of existing conditions and future needs in all parts of the arid region it is proposed to construct a national policy and code of local laws to be submitted to the federal Congress and the legislatures of western States.

BASIS OF REPRESENTATION.

In accordance with a resolution adopted by the International Irrigation Congress at Los Angeles, California, October 14th, 1893, the Third National Irrigation Congress will be composed as follows.

1. All members of the National Executive Committee.
 2. All members of State and Territorial Irrigation Commissions.
 3. Two delegates at large and as many additional delegates as they have Congress districts, to be appointed by their respective governors of the following States and Territories: Arizona, California, Colorado, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington and Wyoming.
 4. Two delegates at large for each State and Territory not enumerated to be appointed by the governors of said States or Territories.
 5. Duly accredited representatives of any foreign nation.
- Each member of the United States Senate and House of Representatives, each governor of a State or Territory, one member each from each of irrigation, of irrigation engineers, of agriculture, of chambers of commerce, of boards of trade, together with one member named by the mayor of each incorporated city of the seventeen Territories named as being directly interested in irrigation, will be honorary members.
- Order of



THE NATIONAL EXECUTIVE COMMITTEE.

ALLES, Secretary.

WILLIAM E. SMYTHE, Chairman.



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My Twenty Acre Farm
Wilford Woodruff, President of the Mormon Church,
Irrigation in Utah, 1895

To the men who came into the valley of the Great Salt Lake in 1847, and during the years immediately following, irrigation was a new and untried resource. Whatever historians may say as to its successful practice in earlier times and in other hands, yet, moved by an impulse that may almost be regarded as inspiration, the very first of Utah's settlers seized upon it as the solution of the problem of life in what was most truly called a desert, and with scarcely more loss of time than was necessary for the transfer of teams from wagon to plow, the water of a mountain stream was brought out of its rocky channel on to the thirsty soil.

I had the honor to be one of the small number who pioneered the way from the Missouri River to the present site of Salt Lake City. In my wagon rode the bedridden leader of the company of Brigham Young, ill of mountain fever, when, on the 24th of July, 1847, we emerged from what is now called Emigration Canyon and gazed upon the valley in which our chief city now stands. That very day potatoes were planted from seed brought more than a thousand miles in our wagons, and the sun baked field was soaked with water turned from the canyon stream.

...

The record of the agriculturalists of Utah, as far as the latter have conformed to the plans laid down by the original settlers seems to me to possess three distinctive and deserving features: first, that small farms are the rule, and give the best results; second, that the land-owners themselves, either individually or in combination, can more profitably and economically lay out canals and acquire an adequate and perpetual water right than to lease or purchase such a right from corporations or capitalists; third, that notwithstanding the dryness of our climate and soil, there is really a great deal less water needed than most farmers think, and consequently, many of us use an extravagant quantity, to our own injury.



My own experience has been asked for, and it will bear out all three of the foregoing propositions: The original idea was that each man's land, both in the city and for farming purposes, should be measured out to him, and he "should be industrious and take care of it." This was but another way of saying he should have no more than he could industriously cultivate and take good care of. So, while our city lots were generous in size -- an acre and quarter, the idea being that thereon might be grown both orchard and

garden -- our fields were small. An early farming plat was subdivided into five-acre tracts, and one was soon afterwards known as the ten-acre plat. In 1850, the third year after the arrival of the Pioneers, I purchased a piece of land of ten acres in what is now known as Farmer's Ward, south of and contiguous to Salt Lake City. In the near vicinity I had already acquired two five-acre lots. These I exchanged for ten acres adjoining the first named tract. This gave me twenty acres in a single farm. With it I resolved to be content, and I immediately began its cultivation.

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I joined my neighbors in placing a dam in a stream from the mountains (then called Mill Creek, now Canyon Creek), and in opening up an irrigation ditch of sufficient size to bring water to their land and mine. This water I have used, and this land I have cultivated, from that time to the present. The products of my farm have been wheat, oats, barley, corn and potatoes. I made it an early rule to follow the practice of annual rotation of crops; for example: I would sow wheat and small grain to the ground that the year before had produced corn and potatoes; and, *vice versa*. I also set aside about two acres out of my twenty for an orchard, and planted trees of the apple, pear, peach, plum and cherry, besides small fruits, and all have done well. During recent years -- for the introduction of the plant is of comparatively recent date in Utah -- I have devoted five acres of my farm to lucern, which has yielded me three good crops each season.

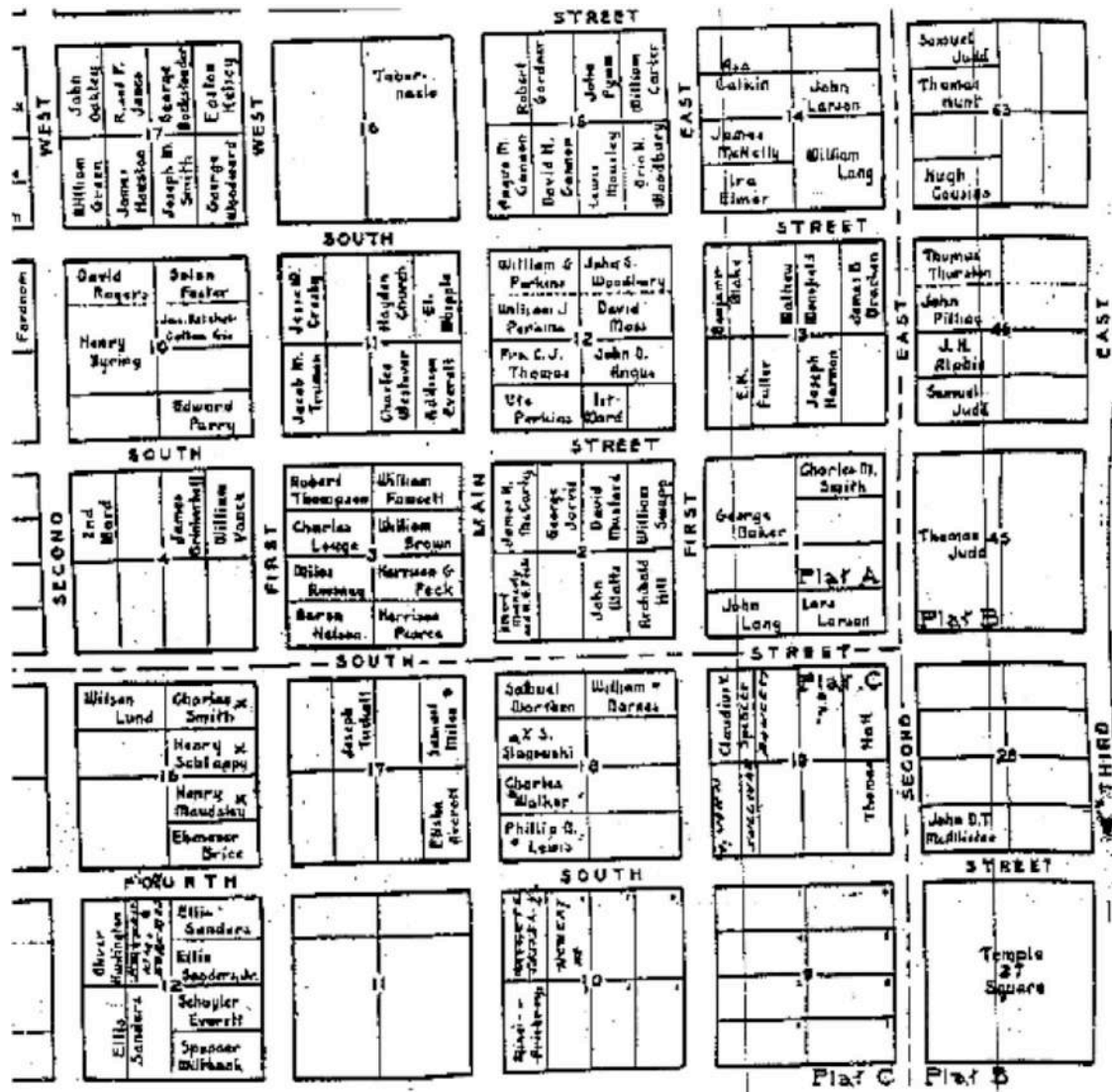


From this twenty-acre farm has come the main support of my family during nearly forty-four years. Only once in that time have I had less than forty bushels of wheat to the acre. Four years ago I had sixty bushels, and two years ago, sixty-five bushels of good, clean wheat to the acre; and one season, from five acres of seven-headed wheat, I actually threshed three hundred and fifty bushels -- seventy bushels to the acre -- which, however, though fine looking grain, was not suitable for milling purposes for flour, as when ground it had almost the coarse appearance of corn meal. Some of my neighbors have with practically certain regularity raised from fifty to sixty-five bushels per acre; and one of them, Mr. William Gibby, took the prize of \$500.00 offered four or five years ago by the *American Agriculturist* for the largest yield of wheat per acre in the United States -- between eighty-five and ninety bushels. I have preferred the White Club variety and had the best results from it; Club and Taos have been the main kinds used in Utah, though at various times and to meet special conditions, other classes have been sown and have yielded well.

As to the amount of water needed, I give again my own experience: I irrigate my crops not more than twice in a season, and the wheat generally but once. As to fertilizers, I have used nothing but barn-yard manure.

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In conclusion, I desire to say that I recognize the advantages of small farms well tilled, and their capacity for furnishing sustenance for the thrifty husbandman. I have found that with much less water than is generally used, the yield from the land would be equally good if not better. And I have also found that the manner inaugurated by the Pioneers of Utah has served its purpose splendidly, has proved a great success, and with us has been no expense to the farmer, except the labor of his own hands. By this system Utah has won the agricultural prominence she now enjoys, and by the same system still more thoroughly carried out, I am sure she will not only maintain but vastly increase her prestige.



From Cadillac Desert
Marc Reisner

"Fifty-six years after the first earth was turned beside City Creek, the Mormons had six million acres under full or partial irrigation in several states. In that year -- 1902 -- the United States government launched its own irrigation program, based on Mormon experience, guided by

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Mormon laws, run largely by Mormons. The agency responsible for it, the U. S. Bureau of Reclamation would build the highest and largest dams in the world on rivers few believed could be controlled -- the Colorado, the Sacramento, the Columbia, the lower Snake -- and run aqueducts for hundreds of miles across deserts and over mountains and through the Continental Divide in order to irrigate more millions of acres and provide water and power to a population equal to that of Italy. Thanks to irrigation, thanks to the Bureau -- an agency few people know -- states such as California, Arizona, and Idaho became populous and wealthy..."



"Late in the 1870's, the boundary of the Great American Desert appeared to have retreated westward across the Rockies to the threshold of the Great Basin. Such a spectacular climatic transformation was not about to be dismissed as a fluke, not by a people who thought themselves handpicked by God to occupy it. Its unspoken principle was divine intervention, and its motto was "Rain Follows the Plow". Since the rains coincided with the headlong westward advance of settlement, the two must somehow be related. Professor Cyrus Thomas, a noted climatologist, was a leading proponent. 'Since the territory (of Colorado) has begun to be settled' he announced in declamatory tones, 'towns and cities built-up, farms cultivated, mines opened, and roads made and travelled, there has been a gradual increase in moisture... I therefore give it my firm conviction that this increase is of a permanent nature, and not periodical, and that it has commenced within eight years past, and that it is in some way connected to the settlement of the country, and that as population increases the moisture will increase.'

Irrigation, which for the most part is a prerequisite to agriculture in Arizona, was first practiced in this region by ancient peoples. In the valleys of the Little Colorado, Salt, and Gila Rivers, and along the Verde River and smaller tributaries are found unmistakable remains of ditches and reservoirs, together with ruins of the cliff dwellings and the communal houses of tribes which had been scattered long before the advent of the Spanish explorers. The character of these remains indicates that these ancient Indians possessed considerable skill in the art of irrigating. Their ditches and reservoirs were finished with hard linings of tamped or burnt clay, and one instance is known where a main canal was cut for a considerable distance through solid

rock. Sometimes a smaller ditch was sunk in the bottom of a large canal to facilitate the carriage of small runs

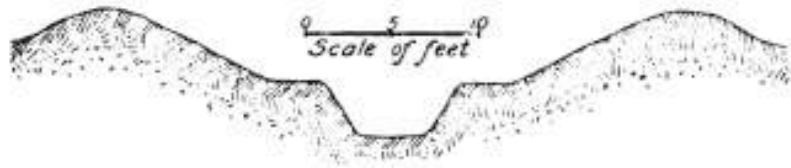


FIG. 1.—Cross section of prehistoric ditch, showing channel in bottom for carrying a small irrigating stream.

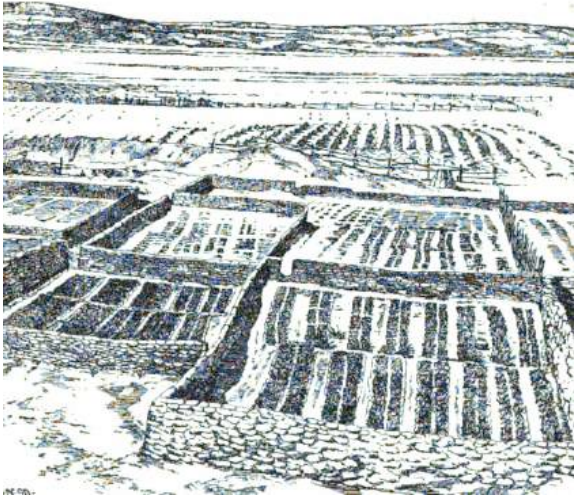
of water, and thus seepage and evaporation were diminished in times of scant flow (fig. 1). The ancient canals in the Salt River Valley aggregated a length of at least 150 miles and were sufficient for the irrigation of 250,000 acres of land,¹ although it is not likely that the whole of this area was ever watered at any one time (fig. 2). In the ruins of the houses of grouted clay are found relics of cotton and corn; beans, squashes, and tobacco were also grown.

PRE-HISTORIC PEOPLE (from The Deseret Weekly 1891)

And the Book of Mormon, which they devoutly believe to be inspired truth, is the only work which pretends to give any authentic information of the prehistoric people of this continent. Whether it be true or false matters not, as long as it is believed by the Mormons, for it gives them a mass of information which they consider reliable, and which the ruins of the valleys they settle serve but to the more firmly establish, in that there is no other record of them. A correspondent of the Salt Lake Herald, speaking of the Casas Grandes Valley of Mexico says:

"Traces are yet to be seen thereabouts of the old reservoirs and canals, probably of the old Toltec civilization. Over against these worthies the present generation have there set themselves down to try the modern with the ancient agriculture. It has been demonstrated that cotton will do well here, and two crops a year of farm products are common. Corn grows here to and extraordinary height, a man on horseback being unable to reach the top of a stalk of corn as it stands in the field."

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Prior to the arrival of the Mormons, Indian irrigated crops by diverting water from both perennial and seasonal water courses. Taking water from the stream may only have happened at times when it was plentiful. Small flat areas could be flooded and seeds were inserted a few inches deep into the wet soil with the aid of a “planting stick”. It is debated how the Indians tended these fields but it is clear that without iron plows they would not have created furrows allowing frequent and efficient watering of the crops.

A hallmark of Indian agriculture is “three sisters planting beds” where corn, beans and squash were planted in small mounds of soil in a flood irrigated field. Bean tendrils

wound up the corn stalks and large squash leaves shaded the soil from the hot sun reducing water evaporation. These fields could be untended for weeks while the Indians foraged or hunted for other food. Native grasses were harvested by collecting grass seed which supplemented the wheat and corn grown in irrigated patches. A variety a berries, roots and nuts, especially pine nuts, were

gathered at some distances from Indian villages.

When the first Mormon missionaries arrived in the summer of 1854, the elders found several Tonaquint villages along Santa Clara Creek along with at least one diversion dam and one ditch (less than a mile in length) which delivered water to small fields where wheat, beans and corn were grown.¹



INFLUENCE OF IRRIGATION UPON PEOPLE AND COUNTRY
Elwood Mead, 1896

While a description of existing conditions in the far West necessarily includes references to many evils and disappointments, there is a brighter side to the picture, and the future is luminous with hopes for humanity. A vast population will make its homes in valleys now vacant and voiceless, yet potentially the best part of our national heritage. They will create institutions which will realize higher ideals of society than the world has yet seen. Irrigation is much more than an affair of ditches and acres. It not only makes civilization possible where men could not live without it, but it shapes that civilization after its own peculiar design. Its underlying influence is that which makes for democracy and individual independence.



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EFFECT OF IRRIGATION ON SOCIAL LIFE

Heretofore one of the evils of the irrigated home has been its isolation. The valleys of many streams are narrow. The broad areas which lie between these valleys are the home of cattle and sheep, but not of men. The Anglo-Saxon thirst for land, and the opportunity which the desert-land act gave to gratify it, resulted at first in a wide separation between homes, and in a loss to the pioneer of the advantages of schools, churches, and social life. Under the larger and later canals the tendency has been in the other direction. The European custom of making homes in village centers has been adopted in parts of Utah, Wyoming, Idaho, and California, and steadily gains public favor. Where farmers live in villages, their families enjoy ready access to schools, churches, libraries, and entertainments. The agricultural society of the future in the Western valleys will realize a happy combination of town and country life -- the independence which springs from the proprietorship of the soil and the satisfaction of the social instinct which comes only with community association. Such conditions are favorable to the growth of the best forms of civilization and the noblest institutions. This is the hope which lies fallow in the arid valleys of the West. Its realization is well worth the struggle which is impending for the reform of our land and water laws, and which will impose high demands upon our statesmanship and call for the exercise of the best order of patriotism.