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Environmental Lessons from Our Pioneer Heritage

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The efforts of the pioneers and their posterity to correct their mistakes in agricultural and ranching practices set an example for us today.

In 1847 the Mormon exodus reached the Great Basin and settled in the shadows of the Rocky Mountains. There they were joined by immigrants from Great Britain, Germany, Switzerland, Scandinavia, and other parts of the world. Most participating in the gathering shared the common experience of conversion to The Church of Jesus Christ of Latter-day Saints. Indeed, their commitment to their faith led them to seek refuge in the seclusion of the Great Basin. They believed that there they could build a Zion society, free from the persecution and hatred that had followed their church from New York to Ohio, to Missouri, and then to Illinois.

As the pioneers began to build Zion, they reshaped the environment to make the land more productive and suitable for their needs. Occasionally, however, their policies and practices were not environmentally sound—over time, the land's ability to provide for them was diminished rather than enhanced. Fortunately, they and their posterity established a pattern of striving to correct their environmental mistakes, once they were aware of them. In so doing, they set a precedent for citizens today.

The Presettlement Environment

Understanding the Great Basin's presettlement environment is requisite to understanding the impact of the pioneers' activities on local ecosystems. The Great Salt Lake Valley and adjacent areas had been visited by travelers, explorers, government agents, and missionaries long before the Mormon pioneers entered. Many early visitors kept journals in which they described the land. From these journals, we get a reasonably good picture of the state of the land and its resources as they existed when the Native Americans were the sole occupants.

Two of the earliest presettlement visitors to the Great Basin, Fathers Domínguez and Escalante, entered Utah in 1776 from present-day Colorado

and traveled west to Utah Valley. They wrote of "marshy estuaries" associated with lakes and rivers, "a good deal of pasturage" along all the streams, and abundant land that could be farmed "with the aid of irrigation." They also wrote of flat stretches of sagebrush, some with associated prickly pear cactus.[1]

Fathers Domínguez and Escalante were particularly interested in identifying potential sites for settlement. They found many in the Great Basin. For example, around present-day Duchesne, Utah, they noted "beautiful poplar groves, fine pastures, timber and firewood not too far away, [enough] for three good settlements." They described the Strawberry Valley as possessing "good pasturages, many springs," "beautiful groves," and "all the conveniences required for a settlement."[2] Concerning Utah Valley, they commented that the area between the Provo and Spanish Fork Rivers consisted of "level meadows with good land for crops . . . with opportunities for irrigation sufficient for two or even three good settlements." So enamored were they with the region that Captain Miera y Pacheo, a cartographer with the expedition, wrote to the king:

> This is the most pleasing, beautiful, and fertile site in all New Spain. It alone is capable of maintaining a settlement with as many people as Mexico City, and of affording its inhabitants many conveniences, for it has everything necessary for the support of human life.[3]

Some sixty years later (1839 or 1840), a Rocky Mountain fur trapper named Osborne Russell gave a similar description of the presettlement Great Salt Lake Valley. He described the area as "a beautiful and fertile valley intersected by large numbers of fine springs which flow from the mountain to the Lake and could with little labour and expense [be] made to irregate [*sic*] the whole Valley."[4]

The presettlement vegetation and water resources of northern Utah also received glowing reports from early visitors. For example, in 1845 the explorer Captain John C. Frémont offered this description of the Bear River Valley in northern Utah:

> I can say of it, in general terms, that the bottoms of this river, (Bear,) and of some of the creeks which I saw, form a natural resting and recruiting station for travellers, now, and in all times to come. The bottoms are extensive; water excellent; timber sufficient; the soil good, and well adapted to the grains and grasses suited to such an elevated region. A military post, and a civilized settlement, would be of great value here; and cattle and horses would do well where grass and salt so much abound. The lake will furnish exhaustless supplies of salt. All the mountain sides here are covered with a valuable nutritious grass, called bunch grass. . . . The beasts of the Indians were fat upon it; our own found it a good subsistence; and its quantity will sustain any amount of cattle, and make this truly a bucolic region.[5]

Other presettlement visitors left descriptions of the Cache, Weber, Pavant, Juab, Grass, Tooele, and Rush Valleys. They, too, mention good water resources in those regions, with rich soil and fine grass in valleys, benches, and foothills. They speak of patches of sagebrush and of high-elevation forests of pines, maples, aspens, and cedars.[6]

The descriptions left by early visitors and pioneers indicate that the presettlement composition of the plant communities consisted of grass in the valley bottoms, bunch grass and sage on the foothill slopes, pinyon-juniper on the upper valley slopes merging into mountain brush, and aspen and conifer in the higher elevations. Moreover, adequate water resources could be found in the springs, streams, rivers, and lakes of the region. The land was indeed well fitted for settlement.

Pioneers Enter the Valley

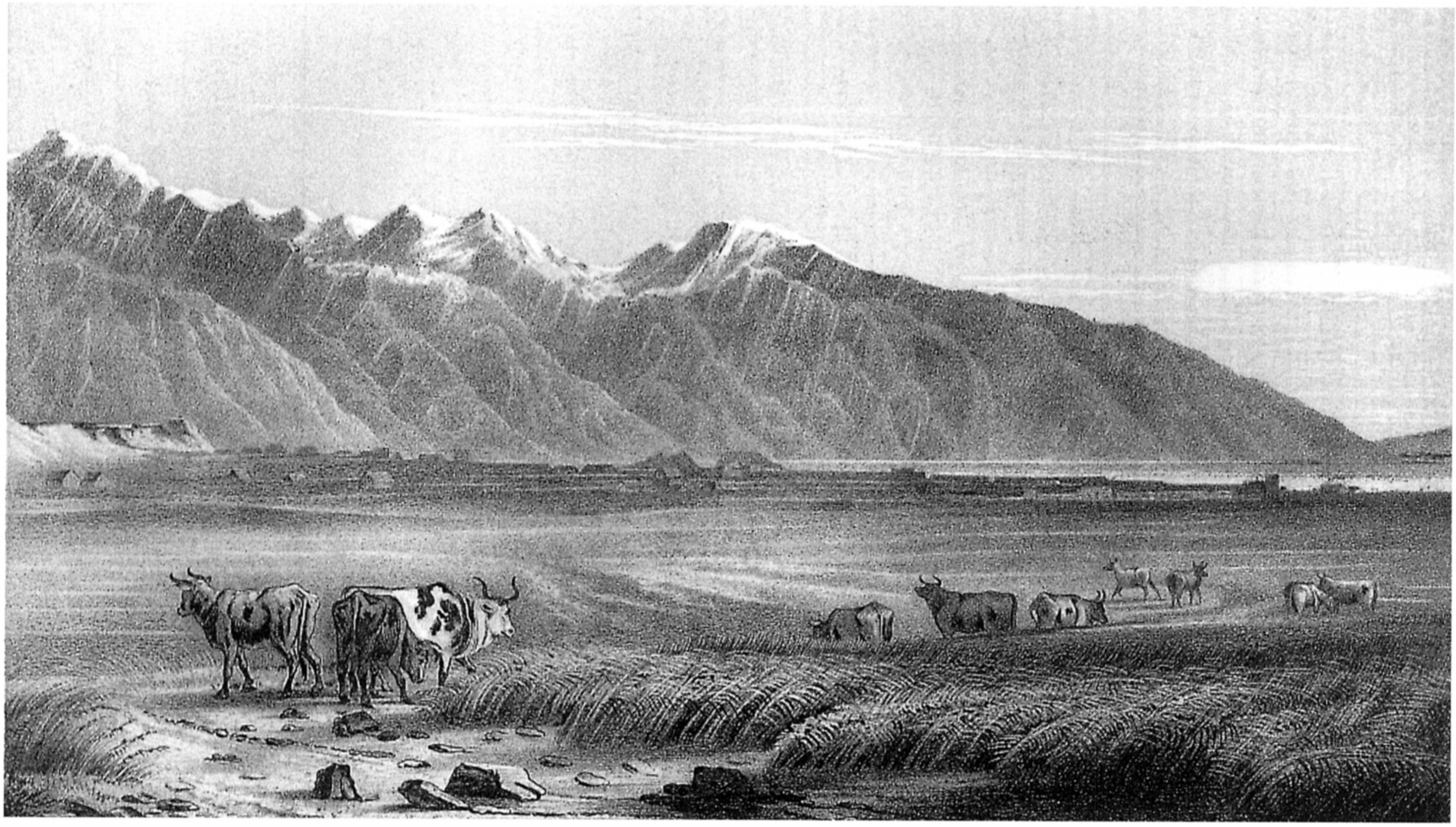
The first Saints to enter the Salt Lake Valley were as impressed with resources as much as earlier visitors had been. For example, William Clayton wrote:

> The grass grows high and thick on the ground and is well mixed with nice green rushes. Feed here for our teams is very plentiful and good and the water is also good. . . . The grass here appears even richer and thicker on the ground than where we left this morning. . . . The grass is about four feet high. . . . We could but remark all along, the richness of the soil and the abundance of high, good looking grass.[7]

Upon entering the Salt Lake Valley, the pioneers wasted no time in beginning their efforts to transform their Rocky Mountain Zion into a fruitful homeland. They did so with determination, enthusiasm, and a sense of urgency. The main company of the Saints left their last camp in Emigration Canyon at about 7:00 A.M. on the morning of July 23, 1847. At 9:30 A.M., they held a prayer and thanksgiving meeting in the valley. By 11:30 A.M., a committee had selected spots for planting potatoes, beans, and corn. By noon they were plowing. By the time a convalescing Brigham Young reached the valley on July 24, potatoes were already in the ground.[8]

Irrigating newly planted crops was a priority for the pioneers. They realized that, unlike Illinois and Missouri, in the Great Basin they could not depend upon "the rains of heaven" to water the crops they planted.[9] As historian Alfred R. Golze explained, "The Mormons were forced to make irrigation a success or perish."[10] During the afternoon of July 23, 1847, they began "irrigation as it is practiced today" by building a dam across City Creek and diverting enough water to soak "five acres of exceedingly dry land."[11] By spring 1848, they had five thousand acres of irrigated land under cultivation.[12]

Community development proceeded in an orderly and well-planned manner. Under Brigham Young's direction, ten-acre blocks were laid out



The Mormons' domestic animals grazing on the tall grass in the Salt Lake Valley. By John Hudson, ca. 1849–50, reproduced in Howard Stansbury's *Exploration and Survey of the Valley of the Great Salt Lake of Utah* (Washington, D.C.: Robert Armstrong, 1853), facing 124.

and divided into eight lots of one and one-quarter acres. The lots and blocks were subsequently assigned to families according to their occupations and needs. Generally, professionals and businessmen each received a lot, while mechanics were given four lots or an entire block. Farmers were given one or two blocks each, depending on the size of their families.[13] The blocks were divided by wide streets with irrigation ditches running down each side to irrigate the orchards and gardens and to carry away sewage.[14]

This pattern of orderly development was repeated as Mormon villages spread along the Wasatch Front and elsewhere in the Mountain West. Walter P. Cottam notes that within thirteen years of the pioneers' arrival in the Salt Lake Valley

> most of the important towns from Logan on the north to St. George on the south had been founded. . . . Each is located at the base of a mountain front, at an altitude conducive to the growth of a variety of farm crops, on a valley plain of rich soil, where mountain streams supply water sufficient for irrigation and culinary purposes. Sites thus selected for settlement were provided with nearby pasture land that furnished year-round feed for farm livestock and with an expanse of desert range suitable for winter grazing. Mountains nearby provided a perpetual flow of life-giving water, timber for building, wood for fuel, and forage for the summer grazing of range stock.[15]

Botanist John Muir gave a description of the success of the Salt Lake Saints as he passed through on a botanical expedition in 1877:

> At first sight there is nothing very marked in the external appearance of the town excepting its leafiness. Most of the houses are veiled with trees, as if set down in the midst of one grand orchard. . . .
>
> Perhaps nineteen twentieths of the houses are built of bluish-gray adobe bricks, and are only one or two stories high, forming fine cottage homes which promise simple comfort within. They are set well back from the street, leaving room for a flower garden, while almost every one has a thrifty orchard at the sides and around the back. The gardens are laid out with great simplicity, indicating love for flowers by people comparatively poor. . . . In almost every one you find daisies, and mint, and lilac bushes, and rows of plain English tulips. Lilacs and tulips are the most characteristic flowers, and nowhere have I seen them in greater perfection.[16]

Pioneer Faith and Environmental Stewardship

Much of the pioneers' motivation and success at settling and developing the land can be attributed to their belief in a God-given stewardship over the land and its resources. Their spiritual leaders had taught them that God had created the earth's resources for the use of man and that God expected them to use those resources wisely.[17] They held as truth a revelation given to the Prophet Joseph Smith in 1831:

> Yea, all things which come of the earth, in the season thereof, are made for the benefit and the use of man, both to please the eye and to gladden the

> heart; Yea, for food and for raiment, for taste and for smell, to strengthen the body and to enliven the soul. And it pleaseth God that he hath given all these things unto man; for unto this end were they made to be used, with judgment, not to excess, neither by extortion. (D&C 59:18–20)

The Saints' leaders reaffirmed this doctrine as they settled in the Great Basin. They testified that God had brought the pioneers to a new promised land in the Mountain West and that he intended to give the land to the Saints as an eternal inheritance if they proved to be wise stewards over its resources. In speaking of their Zion in the Rocky Mountains, Orson Pratt explained:

> This land, about which I have been speaking, is called in some places in the revelations of God to the Prophet Joseph, the land of our inheritance; and in other places it is referred to in the form of stewardships. In one sense it may be considered our inheritance, because the Lord designs, in his own wisdom, that the Latter-day Saints shall possess that land as such, and their dead with them. And having decreed this, even before we ever saw it, he will fulfil it. I will refer you to a part of the revelation given on the 2nd Jan., 1831, at the house of Father Whitmer: "And I hold forth and deign to give unto you greater riches, even a land of promise, a land flowing with milk and honey, upon which there shall be no curse when the Lord cometh: And I will give it unto you for the land of your inheritance,"—not only stewardship, but inheritance; "And this shall be my covenant with you," says the Lord further, "ye shall have it for the land of your inheritance, and for the inheritance of your children, forever, while the earth shall stand, and ye shall possess it again in eternity, no more to pass away." In this sense it is called the land of our inheritance. But when we come to speak definitely, we will have to be proven as stewards first. If we shall be unwise in the disposition of this trust, then it will be very doubtful, whether we get an inheritance in this world or in the world to come.[18]

The Saints were further taught by their leaders that because God had control over the productivity of the land, bounteous yields came only upon conditions of righteousness.[19] Brigham Young warned the Saints that their wickedness could pollute the very soil, air, and water around them,[20] but if they were a righteous people, the earth would "bring forth in its strength."[21] Daniel Wells, Second Counselor in the First Presidency, testified that making the land more productive was an important part of building the kingdom of God and the duty of every righteous person. He further warned that failure to do so would incur divine wrath.[22] Heber C. Kimball instructed the Saints that if they were worthy they could ensure the productivity of their resources by using priesthood power to "dedicate and consecrate" their land, seed, implements, and livestock to God.[23]

Because proper care of the earth and its resources was considered a commandment of God, pioneer Church leaders frequently used the pulpit to give practical advice on farming and resource management. During

church meetings, they taught the Saints what to plant, how to care for their livestock, and how to plow, water, fertilize, and improve the soil. They decried it as "not pleasing in the sight of God" to cultivate more land than was reasonable or to be slothful in weeding and plowing the fields.[24] They believed that one could not separate the wise use of resources from religion. They did not compartmentalize things as secular or religious, temporal or spiritual. Rather, all temporal resources were recognized as also being spiritual, for God created them as such, gave them to man, and commanded that they be used in righteousness and wisdom.[25] Thus, wise management of resources that enhanced the land's capacity to provide for man was viewed as an act of righteousness, and an increase of productivity was a sign of favor from God.

Pioneer Impact on the Environment

These doctrines served the pioneers well as they settled and developed the Great Basin. Unfortunately, in spite of their environmental theology, environmental costs and consequences of settlement became evident over time. For example, Orson Hyde offered the following observation in October 1865:

> I find the longer we live in these valleys that the range is becoming more and more destitute of grass; the grass is not only eaten up by the great amount of stock that feed upon it, but they tramp it out by the very roots; and where grass once grew luxuriantly, there is now nothing but the desert weed and hardly a spear of grass is to be seen.
>
> Between here and the mouth of Emigration kanyon, when our brethren, the Pioneers, first landed here in '47, there was an abundance of grass over all those benches; they were covered with it like a meadow. There is now nothing but the desert weed, the sage, the rabbit-bush, and such like plants, that make very poor feed for stock.[26]

Such early and rapid deterioration of the environment was certainly alarming, leading the modern researcher to ask how it was allowed to occur in light of what the pioneer Saints believed to be their environmental stewardship. Three contributing factors have been suggested. The first and perhaps the foremost factor was inexperience. Dan L. Flores, an environmental historian, argues that the early settlers simply may have been too unfamiliar with the Great Basin ecosystem to understand all the environmental consequences of their activities.[27] The second factor, as historian Thomas G. Alexander argues, was the overzealous pursuit of wealth. He notes that some of the early settlers, "driven by market opportunities," apparently "valued jobs and wealth more than the sanctity of life, stewardship, and reverence for the earth."[28] The third and perhaps most distressing element was the tendency of some to be disobedient to the environmental

principles taught by the early pioneer leaders. As Alexander explains, "Indeed, there is clear evidence that, whatever they were told, many Utah Mormons *acted* as if ecclesiastical pronouncements regarding the environment were, in fact, little more than rhetoric—either that or they forgot or declined to obey the counsel given."[29]

A review of the farming and ranching practices of the early settlers illustrates that, while they did much to accomplish their goals of increasing the utility and productivity of the land, inexperience, avarice, and disobedience did indeed contribute to counterproductive and environmentally harmful practices.

Farming Practices

Perhaps the greatest improvements the pioneers made to the land were agricultural. Most attribute the farming success to their remarkable achievements with irrigation. Despite the vast stretches of desert terrain in the Great Basin, an abundance of water flowed in the streams and rivers originating in the surrounding mountains.[30] The settlers' challenge was to divert the water to the thirsty, but fertile, soil. Although they had little experience with irrigation and made some mistakes, they were still remarkably successful in the endeavor. Most agree the Saints succeeded because, unlike many other communities of their time, they cooperated with one another.[31] Their common faith gave them a sense of divine purpose and concern which mandated that the success of the community transcended individual prosperity. Their leaders taught the importance of such cooperation from the pulpit:

> We can not work here as we could in Jackson County, Mo. In that country we did not have to irrigate. We could settle on a piece of rising ground there, and the rains of heaven watered it. . . . We could settle in any part of the county, or of the counties round about, and the rains of heaven would descend and water our land. . . . If we happen to farm on some of these high grounds, it is very difficult to dig canals and water-ditches to water our little stewardships. What shall we do, then? Join in together, be of one heart and one mind, and let there be a common stock fund, so far as property is concerned, and so far as our own individual labor is concerned. . . . You need to co-operate together in your labors. . . . You need to co-operate in getting out your water from your water-ditches to water your land, and you need to do it in a great many other respects.[32]

Alfred Golze credits the pioneers' cooperation for making irrigation systems that are still "among the finest in the United States today." He further notes that "their laws for appropriation of water and its priority of use have been a pattern to other Western States."[33] Still, lack of experience led to some early environmentally unsound and wasteful irrigation practices.

For example, the settlers frequently over-irrigated by turning their water on in the spring and not shutting it off until the fall.[34] This practice increased the salinity of the soil and leached vital nutrients from it. Moreover, they often failed to make provisions "against seepage or to divert surface drainage."[35] Consequently, some of their precious water resources were lost.

Pioneering Saints also greatly improved the land's productivity through the importation and successful cultivation of food crops. Before the arrival of the pioneers, Native Americans living in the land had to rely on native food plants for subsistence. Serviceberries, chokecherries, gooseberries, and currants were typical sources of fruit. Sunflowers and wild grass seeds constituted their cereal and flour grains.[36] Sego lily, biscuit root, and yampa were the among the roots harvested for food. All such native sources of plant food grew in relatively low-yielding, scattered patches and required considerable amounts of time and energy to forage. They could never support a large population.

In contrast, the food crops imported by the Mormon pioneers were high-yielding, easily harvested species. For example, through the efforts of Wilford Woodruff and other pioneers, nurseries and orchards of fruits such as apples, peaches, pears, cherries, and plums were established throughout the Mountain West.[37] In an 1865 address, John Taylor reminded the Saints:

> We can remember the time when we could not raise peaches to eat, and it was a doubt whether an apple tree would grow or not. Now go and look at your orchards; there is not a better peach growing country in the world than this. How is this? God has blessed the elements for our sakes, and also the earth; but let the Saints leave this place, and it would return again to its wilderness condition; the wicked could not live here.[38]

Imported root crops such as potatoes, carrots, and turnips also thrived under pioneer cultivation. Sugar beets grew exceptionally well for the pioneers, eventually becoming an important cash crop. The 1904 annual Christmas greeting from the First Presidency of the Church summarized the success of the Saints in sugar-beet cultivation:

> The great crops of sugar beets that have been gathered, have been a source of wealth to the community. The establishment of sugar factories in Utah and Idaho has been made possible because of this abundant product. With advanced experience in the cultivation of the beet, and in the manufacture therefrom of first-class sugar, we have promise of a full supply of the saccharine article for home consumption and to supply our neighbors in surrounding states and territories. All this will greatly promote development of the resources and augment the wealth of this intermountain region.[39]

Important cereal grains such as wheat, oats, and barley were also introduced by the pioneers, as well as legumes such as beans and peas. Wheat

fields proved especially prolific. Alexander reports that between the years of 1869 and 1879, output increased by 109 percent and an additional 512 percent over the following two decades.[40]

Not only did these crops produce enough to support a large and growing population, they also yielded a surplus. This allowed the Saints to move away from subsistence farming and begin selling some of their produce. By the 1860s, the Saints were conducting a lively trade in agricultural commodities with markets outside the territory and began testing new types of cash crops. For example, Brigham Young had the pioneers experiment with cotton farming in Southern Utah.[41] Also, mulberry was imported and cultivated to provide feed for silkworms in an attempt to establish a local silk industry.[42] While neither of these cash crops proved very profitable, others such as sugar beets and alfalfa proved to be highly successful.

Unfortunately, the zeal to profit from agriculture led some to waste and abuse natural resources. Orson Hyde observed that overambitious men were trying to cultivate too much land, consequently creating water shortages. He noted that the resulting overall production decreased rather than increased.[43]

In addition to food and cash crops, ornamental and exotic plant species were brought in by the pioneers. Alexander suggests that such introduction was in response to Brigham Young's fostering "the importation of large varieties of alien flora and fauna to the intermountain region."[44] Accordingly, the pioneers introduced trees such as catalpa, locust, chinaberry, and tree-of-heaven, as well as flowers and herbs such as English tulips, hollyhocks, sweet peas, caraway, spearmint, peppermint, and watercress. Some weedy plant species whose seed were contaminates of crop seeds were imported and cultivated unintentionally.

Many of the plant species the pioneers imported, intentionally or otherwise, managed to establish wild populations in the Great Basin. By 1900 approximately 160 species of introduced plants from about thirty-five different families had produced feral populations. Unfortunately, not every plant species introduced was beneficial to the environment.[45] Many were noxious, invasive supercompetitors that displaced native vegetation. For example, cheatgrass was imported during pioneer times and soon dominated land once covered by more palatable native grasses. Although of some value as a forage species in its early stages, full-grown cheatgrass injures the animals ingesting its dry, sharp, spiny seed heads. Moreover, such dry plants constitute a tremendous fire hazard, and they are notorious for rapidly depleting moisture and nutrients from the soil.[46] The gardener's nightmare, bindweed or morning glory *(Convolvulus arvensis)*, may have arrived in Utah during pioneer times.[47] This noxious weed has become so abundant that one frustrated gardener observed, "There is really only one patch of bindweed in the state. It starts at the north and goes clear to the south!"

Other weedy, noxious, and environmentally damaging plant species that came with the settlers include some of the biggest pests, gluttons, and thugs of the plant world. Consider the following list of least-wanted plants that entered Utah during pioneer times: tumbleweed, chickweed, burdock, knapweed, sow thistle, dandelion, cheese weed, Bermuda grass, quack grass, Johnson grass, poison hemlock, deadly nightshade, redroot pigweed, cocklebur, creeping thistle, bull thistle, knotweed, purslane, Jimson weed, stink grass, and marijuana.[48] Lack of understanding and inattention account for the importation of these plants to the Mountain West. Had the early settlers understood that these species would so impact the environment, surely they would not have purposely introduced them and would have taken precautions against their accidental importation.

Ranching Practices

Perhaps the most environmentally harmful activities of the early pioneers were those associated with the livestock industry. While early descriptions of the Great Basin note the excellence of the native pastures for grazing, within a few decades the grasslands were significantly depleted. Most agree the primary cause of the deterioration was overuse.

At first the Mormon herds were small and kept close to the settlements to protect them from Indian hostilities and predatory animals.[49] Small herds were generally pooled to form larger groups of animals, which were placed under the care of livestock keepers. Such an efficient arrangement made it possible for farmers and city dwellers who owned only a few head of stock to be about other business, while their animals—important to them for milk, meat, wool, draft, and transportation—were watched over. By the 1860s, land areas near the settlements were already showing signs of widespread overgrazing. Consequently, the territorial legislature in 1865 enacted a law banning beef cattle and sheep herds from the public lands near the settlements.[50] The communities hoped that doing so would conserve the close ranges for milk cows, draft animals, and riding horses. All other grazing animals were moved much farther afield, where grazing lands and forage were more abundant.

As more and more Mormon immigrants and their livestock entered the area, herds relegated to the more distant pastures increased in number. These herds were soon joined by the herds of "gentile" neighbors who moved in on the fringes.[51] Moreover, the numbers of domestic livestock (sheep and cattle) increased dramatically on Utah ranges after the coming of the railroad in 1869, which provided access to faraway markets. Soon herds were being shipped into the state by outside speculators who saw the vast western rangelands as opportunities for quick profit.[52] The number of animals utilizing the rangelands increased until 1900, when the grazing on

these ranges peaked at 1.1 million animal units (one unit equals five sheep or one cow).[53] It did not take long for these vast herds to reduce the grazing capacity of these once-lush grasslands. The environmental consequences were devastating. As one commentator observed, "Inside his fence the Pioneer made the desert to blossom as a rose, while outside the fence on his range area he made it ten times worse."[54] Two areas that illustrate the extent of the damage caused by overgrazing are Tooele Valley, west of Salt Lake City, and Mountain Meadows, in southwestern Utah.

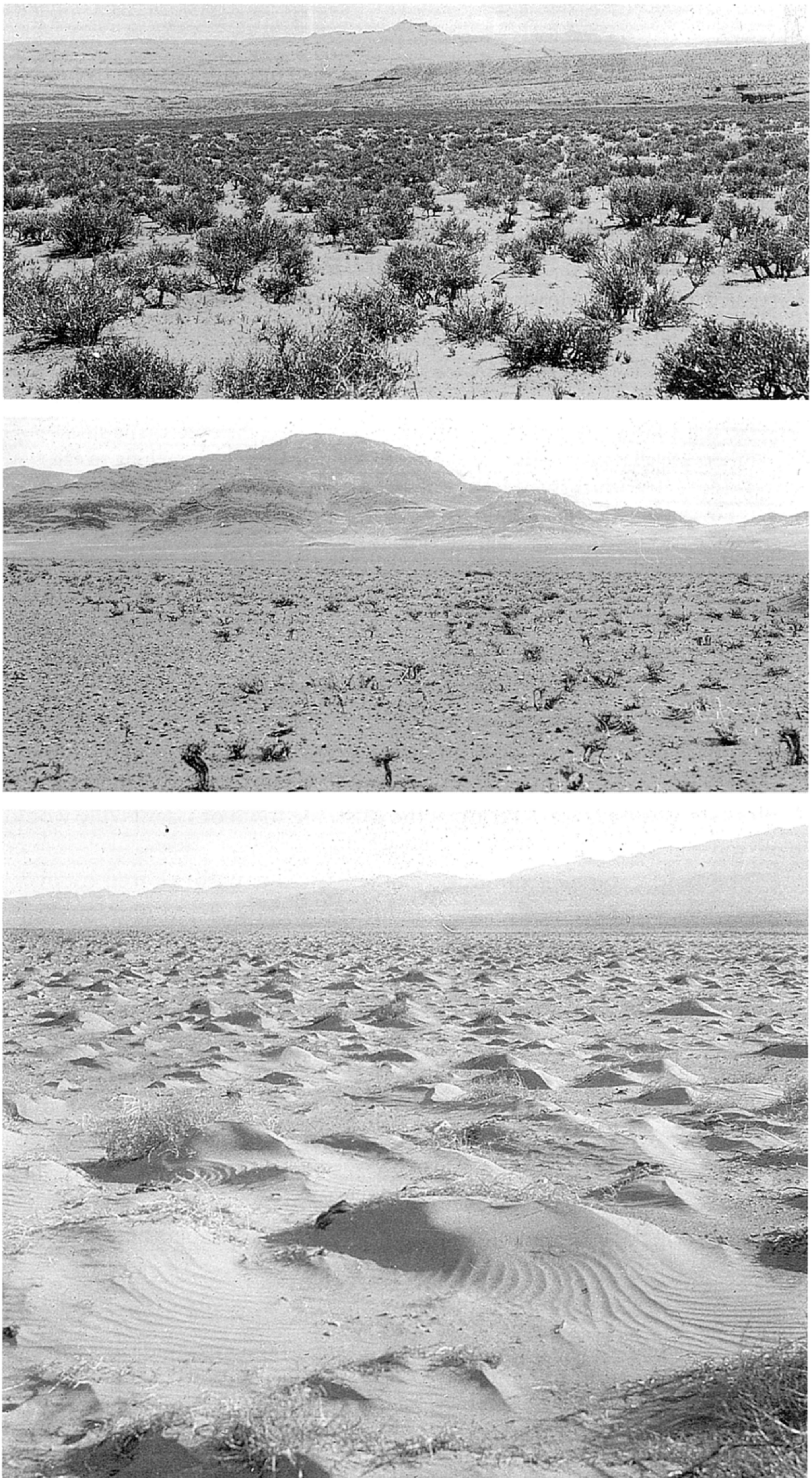
On September 25, 1879, a correspondent to the *Deseret News* wrote about the Tooele area:

> At present the prospect for next year is a gloomy one for the farmers, and in fact all[,] for when the farmer is effected [*sic*] all feel the effects. The stock-raisers are all preparing to drive their stock where there is something to eat. This country, which was once one of the best ranges for stock in the territory, is now among the poorest; the myriads of sheep that have been herded here for the past few years have almost entirely destroyed our range.[55]

From this point, the deterioration continued. With little vegetation left to control run off, floods became common in the 1880s and 1890s. In 1929 the first of many great dust storms that were to hit the Tooele Valley occurred, blowing sand from about 320 acres that overgrazing had denuded. By spring 1935, the dust-blown area had increased to nearly twenty thousand square miles, becoming one of the worst dust bowl areas in the nation. The nearby city of Grantsville was said to be so seriously endangered that "unless steps were taken to control the dust, the town of Grantsville would have to be abandoned within two years."[56]

The landscape of Mountain Meadows was equally altered by overgrazing. Before it became the site of an infamous massacre, Mountain Meadows was a favorite stopping and resting place on the Old Spanish Trail. Travelers knew it for its thriving grasslands and excellent springs. Grazing began in the area in 1862 and continued unrestricted until 1877. When John D. Lee was to be executed in 1877 for participating in the Mountain Meadows massacre, he was asked to point out the actual site of the event, but he could not because the area had changed so much. Since the massacre in 1857, overgrazing had killed most of the forage plants and opened the way for their replacement by shrubs and trees. Moreover, erosion had increased until a huge wash developed (some thirty feet deep and forty feet wide), gutting the meadow and drying up the springs. Junipers had expanded

Sequence of photos illustrating the effects of overgrazing and subsequent wind erosion of Utah desert ranges. *Top:* Emory County desert range, plant community already depleted of grasses and palatable shrubs. *Middle:* White Sage Valley range, showing further grazing and wind erosion—only shrub stems persist. *Bottom:* Wah Wah Valley, exemplifying the final state—a range denuded of vegetation. All photos taken by U.S. Forest Service, 1935.



All photos courtesy Jack D. Brotherson

their occupied acreage of about one thousand acres to more than six thousand acres, making the location unrecognizable.[57] H. H. Bancroft's 1901 assessment of the damage to the area is descriptive:

> Over that spot the curse of the almighty seemed to have fallen. The luxuriant herbage that clothed it twenty years before had disappeared; the springs were dry and wasted, and now there was neither grass nor any green thing, save here and there a copse of sage-brush or of scrub-oak, that served but to make its desolation still more desolate.[58]

Bancroft's observation that in overgrazed areas sagebrush and other less palatable woody plants replace nutritious forage grasses is accurate. Walter Cottam was one of this century's first environmentalists to warn us of this phenomenon:

> Unquestionably, most of the desert vegetation of Utah has also undergone significant transformation during the past century with respect to quantity and quality of forage. Grass types have experienced complete change of aspect throughout the entire area of the Bonneville Basin and have been supplanted by desert shrubs of various kinds.[59]

In a study of the impact of a century of heavy grazing in two representative Great Basin valleys, Cottam showed that grass declined from covering 45 percent of the areas in question (1847) to near zero percent (1937). Winterfat, a highly palatable shrub, also decreased in cover by 16 percent. Conversely, pinyon-juniper, sagebrush, rabbit brush, and shad scale (all woody species) increased coverage over the same time period by a combined total of 61 percent.[60] Other observers have documented similar deterioration throughout the state of Utah in the quantity, quality, and type of rangelands as a result of overgrazing.[61]

Considering these devastating consequences, we wonder why any early settlers would allow their animals to overgraze the land. Once again we must conclude that either they were ignorant of the long-range consequences of such practices or they felt that the financial rewards justified the damage to environment.

A Model for Understanding the Environmental Impact of Settlement

The native ecosystems of the Great Salt Lake region had developed over thousands of years in the absence of high densities of ungulate grazers. One of the essential features of such ecosystems is the functional relationship of their individual components. A change in one component of the ecosystem always influences all others. Such a native ecosystem, developed in isolation away from the impact of man's hands, exhibits an internal integrity or balance. If an agent of change is introduced into the established system, wherein one or several components of the system are altered, the

net effect will be the displacement of the balance of the system. If the agent of change is small and does not become a permanent fixture of the system, then in time the original integrity or balance may return. However, if the agent of change is permanent and of major proportion, the displacement will be dramatic, and the system will move so far away from its original balance that it can never be restored to its earlier state.

The pioneers' farming practices, introduction of new plant species, and introduction of domestic livestock can all be considered major agents of change in the Great Basin ecosystem. Perhaps the overgrazing of livestock is most illustrative. As the animals spread across the land, they fed first upon the more palatable plants that generally dominated the grassland ranges. Because these more palatable species were more often selected for consumption by the livestock, they were placed at a competitive disadvantage to unpalatable species. The constant grazing regularly defoliated the palatable plants, which over time severely restricted their capacity to produce the carbon compounds necessary to maintain roots, stems, and leaves. Over time they began to atrophy, die, and be replaced by their unpalatable competitors such as desert shrubs. With continued time and grazing pressure, even the unpalatable species were placed at a disadvantage and died off. In many places, the land was laid bare. Flooding, dust storms, and erosion followed. Thus livestock overgrazing constituted a powerful agent of change that has forever altered the Great Basin ecosystem.

At this point, even if the land were vacated, the Great Basin ecosystem could not return to its presettlement condition. Consequently, our best and only course of action is to assess the condition of the system at present and guide it to a new position of health and stability. This new position will not, and cannot, be like the presettlement condition, but through care and nurturing, it can be one of well-being and soundness.

Our Pioneer Heritage

Our pioneer forefathers have set a precedent for just such a course of action. When they began to recognize that some of their activities had damaged the environment, through their church and government they took steps to mend the damage. Alexander notes that around the turn of the century Church leaders began to reemphasize the teachings of Joseph Smith and Brigham Young regarding environmental stewardship and accountability. For example, in 1902, Joseph F. Smith directed a special priesthood meeting discussing environmental problems. The brethren voted to "support withdrawal from the market all public lands above Utah cities in order to protect them from damage."[62] A year later, President Smith pled for the brethren to take steps to preserve and restore forest lands and to even consider turning some of their farm acreage into forest.[63]

Around the same time, the government, by then an entity separate from the Church but comprised largely of Church members, also began work to protect and restore the environment. For example, in 1904 courts issued an injunction prohibiting smelters from processing ore containing more than 10 percent sulphur and from releasing any arsenic into the air.[64] In 1905, the state legislature established a conservation commission to study environmental damage.[65] By 1910, the Forest Service was operating in Utah. W. Jones Bowen, one of the early forest rangers to work in the state, noted that at the time the Uintah National Forest was created, most of the commercial timber in the Utah Valley drainage had been logged out, but "men of vision" set to work planting and reforesting much of the area.[66] Further, these early foresters took immediate steps to restrict the grazing on the native forests by holding the vast herds of sheep and cattle off the land until the vegetation could grow and mature.

Representing his constituency, Utah's Senator Reed Smoot became known as a "business-minded conservationist" as he promoted federal legislation to regulate land use and protect watersheds.[67] The soil conservation service also began work in the state, taking steps to educate the public on how to combat soil erosion. For example, in the Tooele Valley, workers designated an overgrazed, barren, sterile dust bowl as a demonstration plot. Among other things, they reseeded the area, applied various mechanical treatments, and protected it from overgrazing, trampling, and fire. By 1938 the demonstration area supported vegetation once again, and the terrible livestock-killing dust storms that plagued the region ceased.[68]

These conservation efforts, and many others like them, demonstrate that regardless of what led to the early settlers' involvement in activities that harmed the environment, they and subsequent generations worked to repair the damage, once they recognized the need. Many volunteered to sacrifice some opportunities for wealth in order to conserve resources. Those without such a conscience were forced to change behavior through laws enacted by a government that then valued conservation. The results of the environmental efforts can be illustrated by Cottam's observation made in the late 1940s about the success of earlier Forest Service work:

> I just can't believe how these ranges have improved. The aspens are reproducing again, the grasses are lush and full and up to a horse's belly. Go to Mt. Nebo or the Fish Lake area, for instance, where they had been stripped of cover, they are now lush with growth again. I've known these mountains for many decades. But they are not the same mountains now. The Forest Service has done a magnificent job. And I think the same recovery job could be done with other aspects of our environmental problem, given the same incentive, public support and governmental persistence.[69]

Conclusion

In "The Tragedy of the Commons," Garrett Hardin, an ecologist, gives insights to some environmental principles that apply to the pioneer settlement and colonization of the Salt Lake Valley and neighboring territories. Ecologists define a "commons" as a basic resource or set of resources that a community shares. Hardin notes that communities typically but regrettably view commons as inexhaustible sources of sustenance and wealth that can be exploited by anyone in any way they please. Unfortunately, such a mentality usually leads to environmental tragedy as too few people take responsibility to manage and conserve the commons. Unabated exploitation coupled with personal disregard promotes degradation and eventual destruction of resources. Consequently, the standard of living is lowered for the entire community.[70]

Elements of Hardin's tragedy of the commons can be seen in the pioneers' activities. The vast untrammeled wilderness of the Great Basin constituted the pioneer commons. As the pioneer Saints relied on their commons first for subsistence and then for wealth, these resources were exploited. The pioneers cultivated more land and increased herd sizes. Consequently, the settlers prospered for a time, but the commons starved.

Hardin suggests that there are two means of averting and repairing the tragedy of the commons, one technical and the other moral.[71] Solving the commons problem by technical means requires only a change in management tools or practices. Technical solutions work well to repair environmental damage resulting from ignorance. Moral solutions are more difficult to enact because they require a change of values and ethics in people. Moral solutions work well to avert and repair environmental damage caused by greed and disobedience. For example, as long as people value wealth and prosperity more than the environment, they will continue to exploit the commons and degrade the ecosystem.

The settlers around the turn of the twentieth century sought both technical and moral avenues of averting and repairing environmental harm. Their goal was to restore the ecosystem to a condition of health.

For technical solutions, they employed conservation practices to restore forests and rangelands. For moral solutions, men such as Orson Hyde and Joseph F. Smith recognized the danger of valuing wealth more than the environment in early settlement times and sought to change the values and beliefs of their contemporaries. They reminded the Saints of their God-given stewardship over the land and of the importance of conserving resources for the future. Their efforts, combined with government intervention, fostered a renewed appreciation and respect for the environment and left those who have followed a lesson and a legacy concerning environmental responsibility.

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