History of Efforts to Manage Soil Conditions in the Uintah Basin from 1920s to 1950s

Introduction:

The Uintah Basin in northeastern Utah offers a case study of human efforts to manage the environment, specifically the management of soils. From the first major soil study in the 1920s through the bust of the Great Depression and the boom of post-World War II, many of these efforts have been directed by the U.S. Department of Agriculture, particularly after the Soil Conservation Service was created in 1935. The soil survey reports from the 1920's-1959 are the basis of this research into the botany, anthropology, and history of the Basin.¹

The Uintah Basin soils were particularly impacted by the development of livestock grazing which came as a result of the continual westward expansion of Anglo-Americans and their efforts to commercially develop resources in the Basin. These Settlers fundamentally altered the Basin environs and damaged the soils. The history of twentieth century efforts to manage soils within the Basin encompasses research in botany, anthropology and history in order to give an in-depth account of how the environment of the Basin was altered. The goal of the research is to encourage others to explore the immediate and long term impact of human interactions with their environs.

The Uintah Basin Region Inhabitants:

For hundreds of years, the Uintah Basin was occupied by people the Spaniards came to call Utes. They were hunters, gatherers, fishers, farmers, and traders. The Basin was only part of thousands of miles of lands in what are now Utah, Wyoming, Colorado, New Mexico, and Arizona, in which the Utes lived. Organized in family bands, the Utes identified themselves with the resources that sustained them.

The Sevier Lake Utes were the Pah Vant, which means “close to water.” The large group, which used the Utah Lake area, was the Tumpanawach or “fisheaters.” Those living near the Yampa River Basin in Colorado were the Yamarika or “carrot-eaters.” The Utes lived in family groups and sustained themselves through a variety of activities – hunting, gathering, fishing, agriculture, and trade. These activities were seasonal and cyclical, and the relatively small numbers of Utes did not drastically alter the Basin environment.²

The Euro-American settlers who came into the region did not value these low-impact economic activities and in 1861, declared the Basin: “… one vast continuity of waste, and measurably valueless, except for nomadic purposes, hunting grounds for Indians, and to hold the world together.”³ The settlers petitioned the federal government to establish an Indian reservation in the Basin. The petition resulted in an executive order creating the Uintah Reservation. That reservation became the refuge for Utes forced off their lands along the Wasatch Front.⁴ In the 1880s, the Uncompahgre Reservation was also created in the Basin for Utes forced out of Colorado.⁵

The years of confinement on the reservations were difficult for the people who came to be called the Northern Utes. They suffered dislocation and deprivation. There were efforts to force them to become farmers and ranchers, but most Utes resisted.

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³Deseret News, 25 October 1861, as quoted in Conetah, 41
It was the opening of the Uncompahgre reservation in 1887 and the Uintah-Ouray Reservation in 1905 to non-Utes which resulted in the complete disruption of the Ute ways of living, in the increase of human inhabitants, and the eventual degradation of the soils of the Uintah Basin. The lands of the Basin became a patchwork of tribal lands, Indian allotments, federal water and forest projects, private property, and mines. Many of these lands were mismanaged and stressed.

**Uintah Basin Geography:**

The Uintah Basin is located in the north-eastern portion of the state of Utah as well as a small portion of Northern Colorado. The Uintah Basin receives approximately 8.5 inches of precipitation a year, which leads to many rivers and creeks, including the Green River, Uintah River, Ashley Creek, and the Duchesne River. Uintah Basin gets most of its usable water from the lakes and rivers in the county, with the largest usable water source being the Green River. The Uintah Basin also features very sloped mountainous areas, which makes harnessing usable rainwater somewhat difficult as steep slopes encourage heavy torrents of water, which create larger areas for erosion to exist. The Uintah Basin is considered to be “steppe,” “highlands,” or “semi-arid” climatic zones, which are characteristic of containing small grasses and shrubs, as well as featuring some harsh desert like conditions in some portions. The largest industries within Uintah County include the growing of alfalfa and hay, raising cattle and sheep, and oil and gas extraction according to a report conducted on the Basin by the National Resource and Conservation Service. 6

**Major Concerns within the Uintah Basin:**

The greatest concerns for the Uintah Basin involving soil health include: over grazing, lack of proper water distribution, harsh environmental conditions, invasive plant species, and improper land

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management. Overgrazing by livestock animals, such as cows and sheep, affect the soil quality by exhausting native vegetation for animal feed. This encouraged grazing by these animals introduces new vegetative species and alters the ecosystem. A lack of proper water management affects the soil of the Uintah Basin by not fully utilizing the available water resources that is received. Much of the usable water is wasted instead of conserved properly for further use in drier seasons. Contaminated water and disputed water rights amongst the Utes and the settlers of the Uintah Basin complicated this matter even further.

The harsh environmental conditions found in the arid region of the Uintah Basin further adds to the difficulty of maintaining healthy vegetation and soil. Not only is the Uintah Basin incredibly dry with little vegetation, but the rainfall that is received is often through tumultuous thunderstorms. The heavy thunderstorms, along with periods of freezing and thawing between growing seasons, place a heavy stress on the soil. Topographic differences in elevation in the Uintah Basin affects soil as well by allowing more water runoff to spill into areas and alter water tables along this area. Gradual degradation of soil quality and vegetative cover can no longer protect the available water in higher elevated zones and instead filters into rivers and streams. The runoff water from these elevated zones take with it essential nutrients and relocate the sediments elsewhere for no real value.

Invasive plant species are also a major concern. Invasive plant species affect soil health by out-competing the native shrubs, forbs, and grasses, therefore altering the ecosystem. The invasive plant species slowly began to dominate the native perennial grasses and shrubs, and replace these with annual grasses such as cheatgrass. Cheatgrass, for example, is problematic because it competes with the native species for available resources and exhausts nutrients the native plants required to grow. These invasive species are nearly all annuals, which contribute little value. The native vegetation that does exist in this region contains small pockets of usable nutrients, such as nitrogen, which is extremely
beneficial in arid regions. The invasive species also began to alter plant communities, causing shrubs to replace native grasses. Shrubs are less desirable as they offer much less coverage, making the soil very susceptible to further erosion from the elements. Most of the invasive plant species are not even useful as animal feed for grazing because many of the plants are toxic to livestock.

Improper land management is an issue because of the lax enforcement that is used to regulate land usage, which allows anybody to extensively exploit the land for personal benefit. If the land within the Uintah Basin is not conserved and protected properly, then the available land is vulnerable to exploitation. Because of improper land management, plants, soils, and entire ecosystems are altered and degraded. Almost all of the concerns with the soil occur because the land was exploited for personal benefit without regard to the sustainability for the future of the land in the Uintah Basin. As we begin to understand more about the utilization of natural resources from our history, we must also learn to protect the land, so we do not face severe sustainability issues in the Uintah Basin’s future.

**Soil Importance and Overview:**

Soil quality and conditions are important primarily because of the relationship that soil shares with plants and how it affects human development, as well as human interaction with the land. Human existence is dependent upon the reaction that occurs in photosynthesizing organisms, such as plants (along with algae and some types of bacteria). By performing photosynthesis, plants transform light energy received from the sun to sugar molecules, which are essential for all life to exist. Photosynthesis

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also releases oxygen as a byproduct, which also is necessary for human existence. Photosynthesis is represented by the equation: \(6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + \text{Energy}\). Plants also are used for a number of different functions, such as; clothing, food, medicine, shelter, fuel, and many other functions. In short, human life has been greatly benefitted from plants and their multitude of uses.

Different plants obviously contribute different qualities to a soil. For example, annual plants are not believed to be as beneficial to the soil as compared to a plant that grows perennially. Annual plants are generally associated with being very herbaceous and only capable of surviving one growing season. Annual plants generally have a shallower root system, which restricts the amount of water and mineral nutrition that the annual may receive. Annual plants are also incredibly dependent on the water that is received in the growing seasons. Without sufficient usable water, annuals will often die during periods of insufficient water intake. Many types of commercial crops such as, corn, wheat, rice, lettuce, and peas are annuals.

Perennial plants, or plants that are considered long lived, are often associated with being “woody” plants and have a larger root system than annual plants. The larger root systems that are characteristic of perennial plants are generally also associated to be more beneficial to soils because the deeper root systems of the perennial plants can reach greater depths underneath the soil as compared to the annual plants. The larger root systems of the perennial plants can use the deeper root length to absorb more minerals and water from the soil. Often, perennial plants above-ground vegetative structures will begin to die back in the colder seasons of fall and winter. Even when the perennial plant begins to die back in these colder seasons, it still contributes to soil activity and plant growth. The
perennial plant still has considerable root support to hold the soil in place, and the wilting plant will provide fodder and energy to upcoming germination period.\textsuperscript{9}

Plant life is essentially dependent on the actions that occur in the soil. Not only does soil create a physical area for plants to exist, but soil also creates chemical reactions that allow plants to absorb minerals and nutrients to be absorbed through the plants roots. Soil also creates an area for water and air filtration for the roots of the plants to absorb the nutrients necessary for plant life to occur. Soil quality affects the level of plant growth and health, which in turn helps us as humans by creating usable sugars and oxygen along with other benefits that plants are used for. So, in a way, soil quality affects the quality of life for not only plants but humans as well. It would be in our best interest to understand the properties of soil that directly affect plant health, which in turn affects the quality of life that humans witness.

Soil is important to the development of the plants as the soil holds minerals necessary for the plant to grow and survive. The minerals needed for plant vegetation to exist (known as essential elements) can be divided into by two categories: macronutrients and micronutrients. The macronutrients are required by the plant in much greater quantity than the micronutrients and are identified as these nine elements: sulfur, phosphorus, magnesium, hydrogen, nitrogen, calcium, potassium, carbon, and oxygen. The micronutrients are still essential for plants to grow but are required in smaller amounts. The eight micronutrients are iron, boron, zinc, copper, molybdenum, chlorine, nickel, and manganese.\textsuperscript{10}

Soil is formed from weathering processes that have occurred throughout an extensive period of time along with the decomposition of rocks and minerals. Soil is also considered to be “living”, as there

\textsuperscript{9} P. B. Lister, L.A. Stoddart, George Stewart, T. Dean Phinney, Wayne Larson, and R. R. Humphrey, Uintah Basin Inter-Agency Range Report, 15 February 1938, Record Group 75, National Archives.

are many organisms that exist in the soil, such as earthworms, fungi and bacteria that help contribute to the recycling of nutrients throughout the soil. Soil can be classified into three main categories and one sub-category. The A horizon, or the topsoil, is the uppermost zone of soil and is important due to the large amount of chemical and biological activity present. The B horizon, or subsoil, is the middle soil zone that contains little organic matter and mostly contains material that has been leached from the topsoil down below. The C horizon is the base of the soil and is mostly composed of bedrock and contains little to no organic matter. The sub-category of soil is sometimes referred to as the AP zone. This refers to the plowing that often occurs within the A and B zones, which have been utilized to help improve the recycling of nutrients and overall soil quality. The different zones are often easily categorized by the color of the soil; the darker the soil, the more organic matter is contained.\textsuperscript{11}

One condition that is known to be detrimental to nearly all plants is that of alkali soil. Alkali soil is known as soil comprised of enough soluble salts to present a danger to the growth and development of plants. Salts inhibit the plants’ ability to take up water due to a change in osmotic potential. This limits the uptake of water soluble nutrients essential for plants to survive.

Soils that are highly alkaline are detrimental because they limit the availability of water and nutrients, as well as limit the capacity for proper filtration. The soluble salt present in these alkali soils are rather simple in definition. According to the Utah State University publication on alkali soils, the alkali soils salts are “made up of any one, or a mixture, of the following salts: sodium chloride (common salt) sodium carbonate (washing soda), sodium sulphate (Glauber’s salt), sodium nitrate (Chili saltpeter), and magnesium sulphate (Epsom salt). A number of other salts are found in a few places, but the ones mentioned above are more common than any others.”\textsuperscript{12} Alkaline soils normally occur in areas in which

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\item[11] Raven, 650
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there is little rainfall throughout the year. Areas that have little rainfall do not have the necessary amount of water filtration to leach out the soluble materials, such as the mentioned soluble salts. Arid regions, such as those of the Uintah Basin, consistently deal with the issue of alkaline soil contamination that prevents healthy plant growth.\textsuperscript{13}

Along with being a matrix of high activity, soil has some other unique qualities in regards to the overall ability to help plants develop. One interesting feature of soil is that the roots that exist in soil mostly take in nutrients in the form of cations, or positively charged ions. There is a process known as the “cation exchange” that occurs in soil with plant roots that allows the cations to attach to negatively charged soil components, such as humus (black, organic rich zone of soil) and clay. This cation exchange allows the plant to essentially recycle weakly bound cations from the plant root to the soil to utilize the available nutrients more efficiently. This makes soil, such as clay and humus, incredibly important for the plants development.

Conversely, negatively charged ions, known as anions, are much more likely to be leached out of the soil compared to cations. Because anions carry a negative charge, these minerals are much easier to be leached away because their charge does not bond with clay and humus well. Instead, what happens to negatively charged nutrients, such as nitrate, is that it becomes much more susceptible to being washed or eroded away and ends up being relocated to different locations through waterways. Because of this, many soils become deficient of macronutrients, such as nitrogen. Nitrogen is commonly believed to be one of the biggest essential nutrients that limit the ability for plants to develop properly.\textsuperscript{14}

In summary, regarding the importance of soil, most vegetation depends on the quality of the soil. Soil needs to have sufficient minerals, water, aeration, and ideally large amounts of microflora to create a favorable soil environment. Soil is considered to be very active chemically and biologically. Soil


\textsuperscript{14} Harris and Butt, 13.
quality affects the quality of vegetative life, which is beneficial to humans in numerous ways. Vegetative quality often improves the quality of life for many different people and cultures by creating a commodity that affects local and global economies. Learning how to improve the quality of soil will ultimately become much more of a pressing matter as the quality of the soil in one’s environment will determine the level of economic sustainability within the area. It is also important to understand how these soils have been altered and how they can be improved and secured for the future.

**Introduction to Soil Survey Reports:**

The soil survey reports on which my research focuses span from early 1920-1959. The soil survey reports give a strong scientific approach to help us to understand how the land was treated in the Uintah Basin during these times. Some reports come from the Utah Agricultural Experiment Station established in 1888 at Utah State University as part of a national network at land-grant colleges. Other reports come from federal soil surveys which began in 1899 under the U.S. Department of Agricultural Division of Soils, today called the National Cooperative Soil Survey. The earliest reports of areas within the Uintah Basin are from Ashley Valley and the Uintah River Valley area. A major report of the entire Basin was done during the Great Depression. In the 1950s a report was completed for the Roosevelt-Duchesne area.

Each report examines in detail the soil and vegetative quality in parts of the Uintah Basin, giving data over the course of several years. The soil survey reports were conducted by soil conservation experts with the most knowledge in their field at the time. Most of the reports include information about the area, the people, the soils, the vegetation, government interactions, and scientific analyses.

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Along with these reports I have strengthened my understanding of the Uintah Basin environment by utilizing additional materials such as newspaper and scholarly articles.

**Ashley Valley, Utah, 1920s:**

The soil survey from 1924 is interesting because it tries to determine why the quality of soil and vegetation had begun to harshly decline within the Uintah Basin. Uintah County, where Ashley Valley is located, had only been organized by white settlers since 1880 and was viewed as a quality location for settlers to establish their culture. Since their arrival, settlers had exploited the land. The area of Ashley Valley is located on the easternmost edge of Utah, 20 miles south of the northern border. The largest city in the Ashley Valley area in 1924 was Vernal, which was located in the central-western portion of this region and had a population of only 1,309. There was no successful cash crop grown within Ashley Valley, and the settlers instead focused on harvesting animal products for commercial success.¹⁷

**People of Ashley Valley, Utah, 1920s:**

The report of Ashley Valley focuses primarily on the white settlers of this region and how they interacted with the land within the Uintah Basin. Ashley Valley in the 1920s did not possess a successful commercial cash crop. Much of the industry was driven by animal domestication instead of relying on cash crops, and the vegetation was regarded as animal feed by the white settlers. It is believed that “the period from 1914 to 1920 was one of the most favorable for ranchers and farmers in the history of the

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country." This began to represent the overall policy of the white settlers in the Uintah Basin and much of the country in this period in American history, which was to utilize as much of the land as the land would allow.

The Anglo-Americans who began to set up settlements along the Uintah Basin had a great abundance of resources for their grazing animals to consume and let the animals graze often as they thought fit. The soil survey report of 1924 does not mention much interaction between the Anglo settlers and the Northern Utes other than that the “Indians gave the settlers considerable trouble.” As a consequence, many United States soldiers were maintained for several years at Fort Thornburg, which no doubt led to more unrest between the Utes and the white settlers. The settlers who began to utilize Ashley Valley for economic profit introduced sheep and cattle for livestock production. Raising sheep was considered to be the most important livestock method, followed by raising cattle. The worth of a wool chip in Uintah County in 1909 was reported to be more than $57,000, and 10 years later it had increased to nine times that amount. The settlers also relied on turkey-raising as well as beekeeping as sources of early revenue, although they were not relied upon as extensively as the sheep and cattle.

**Soils of Ashley Valley, Utah, 1920s:**

The soils in Ashley Valley were produced under arid conditions and are very dry and poor for much agricultural value. Because of the dry environment of the Uintah Basin, much of the soil accumulates lime as there is little rainfall to allow for sufficient filtration. The lime that accumulates in these desert-like soils reaches into the subsoil (or B horizon) and greatly affects vegetative growth by limiting water and mineral uptake in plant’s root zones. The surface soils are created from alluvium

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19 Strahorn, et al, 909.
deposits that have been disturbed or are represented by a thin, slightly cracked crust that has been undisturbed.

The surface soil with the slightly cracked crust most often indicates poor soil with high levels of alkaline soil and is more clayey in nature. Alluvium surface soil is loamier and more desirable for agriculture as it has greater porosity and allows for greater surface area for filtration. It often consists of more biomass used for mineral uptake. There was also no fertilizer that was used in these areas other than animal manure, which limits the amount of usable minerals for soil growth and quality.\textsuperscript{21} Compaction from increased population of white settlers as well as trampling caused through the introduction of livestock animals slightly affected the quality of soil. The compaction from human interaction began to reduce the level of filtration allowed in the soil to properly create the beneficial chemical changes for quality soil.

\textbf{Vegetation of Ashley Valley, Utah, 1920s:}

The native vegetation of Ashley Valley in 1920 featured shrubs, trees and grasses that are some of the most grazing tolerant plants in the entire world including white sage (\textit{Salvia apiana}). Because of the level of tolerance from much of the native vegetation of Ashley Valley, the level of destruction on the native species was considered to be about three times less severe than had it been another plant community. However, even with the high level of tolerance of grazing animals, the native plant species of Ashley Valley began to show significant changes when white settlers introduced grazing animals. Grazing animals were allowed to graze essentially year round with no limitations, and the vegetative biomass began to show signs of degradation. Large portions of shrubs and forbs were also intentionally

\textsuperscript{21} Strahorn. et al, 904-914.
burned or otherwise killed in order to increase the proportions of economically important vegetation to the white settlers.  

Small grains and alfalfa were grown in roughly 8,500 acres of the land in 1920. The small grains and alfalfa were used in “less desirable areas for farming” and often in uneven geographical landscapes within Ashley Valley. The vegetation of this area directly affected the quality of soil as the cultivated grains and alfalfa began to alter the native ecosystem as it introduced biological competition within a small niche ecosystem. With the competition of new plants and animals in Ashley Valley, the settlers began to recognize that there were invasive species of plants that were highly detrimental to the native vegetation. Some of the more problematic invasive species that were becoming introduced were yellow starthistle, salt cedar, cheatgrass, leafy spurge, and knapweed.

Concerns in Ashley Valley, Utah, 1920s:

There were many concerns that arose in this period in the Uintah Basin. One concern was that the vegetation was being exhausted at an alarming rate through the introduction of grazing animals and reliance on them for commercial success. The grazing animals obliterated native vegetation that had persisted in this region for centuries. Grazing animals began to introduce invasive species to the area, which competed for resources with local vegetation. Water availability was also a point of concern as settlers as early as 1920 began to notice that the heavy concentration of water was wastefully used and often led to waterlogged and alkaline soil.

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25 Strahorn, et al., 936.
Uintah River Valley Area, Utah, 1920s

The area that was studied in the 1925 soil survey report included much of Uintah Valley, which is situated in the northwestern part of Uintah County. The studied area also examined many tributary streams, benches, mesas and other extensive rough land. The boundaries for this report fell between the Uintah Special Meridian boundaries to the west, the Green and Duchesne River on the southern border, and the east and northern boundaries along established lines drawn in response to the major towns in those areas. These lines were drawn to consist of all major areas that were used for irrigation purposes in 1925. Much of the area studied in this soil survey report was along irregular shaped boundaries and on uneven topography. The total area evaluated in this report was 298 square miles or 190,720 acres.  

People of the Uintah River Valley Area, Utah, 1920s:

The Utes of the Uintah and Ouray Indian Reservations were composed of three bands of Ute Indians, which were the Uinta, Whiteriver and Uncompahgre bands. All three of the Ute bands were essentially migrants that had been moved from one reservation to another. The Uintah band came from the southern part of Utah around 1866; the Whiteriver band was forced to relocate from White River Colorado around 1880; and the Uncompaghre relocated from the Uncompaghre River in Colorado around 1881. The total number of Utes that occupied Indian Reservations during this time was believed to be around 1,115. The Utes held land for agricultural use; however, the soil survey report related that there was a severe decrease in agricultural operations performed by the Utes because of “great

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much antipathy for work.” 27 Much of this land was rented out by the Utes under leases to non-Ute inhabitants of the Uintah Basin.

Those inhabitants were very much focused on the production of agricultural products such as beef, cattle, poultry, wool, honey and cream. It is interesting to note that the report indicates that, “the Uintah River Valley area is especially well adapted to the production of livestock and dairying.”28 This is interesting as the land initially looked exceptional because only until recently had the land ever been seized for animal foraging. The Uintah River Valley Area began to open up with more tracts of land that had been rented out by the Utes, or encroached on otherwise. This period in Uintah Basin history represents some of the worst farming and agricultural practices that have ever taken place and also devastated the land.

**Soils of the Uintah River Valley Area, Utah, 1920s:**

The soils reported in this report were organized into four main groups: residual soils, old valley-filling soils, recent-alluvial soils, and wind laden soils. The residual soils were created by the weathering of rocks; the old valley-filling soils were created from unrefined water deposition; the recent-alluvial soils are characterized by soils that have been formed from stream deposits that have had little change or weathering since the initial deposit; and wind-laden soils are the soils that have been created by the exclusive weathering of wind. The soils types of this report can be further differentiated by origin, color, structure and coarseness after they had been separated into one of the initial four groups. It should be noted that all of the soil was examined in its virgin or natural state.29

All the soils that were studied in this report were considered calcareous. This simply means that soils contain calcium carbonate and in turn classifies these soils as suspect for becoming alkaline. The

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alkali soils as examined in 1925 were credited to becoming alkaline due to a, “lack of drainage, to over irrigation, or to seepage, either from canals or from higher lying irrigated lands”. The soils of the Uintah River Valley Area were valued according to the soil type, location, and access to irrigation water. The most desirable soils were valued at $100-$50 per acre, while the most basic usable land was valued at $10-$20 an acre.

**Vegetation of Uintah River Valley Area, Utah, 1925:**

Much of the native vegetation of the Uintah River Valley Area included desert shrubs capable of growing 3 to 4 feet tall. These shrubs included greasewood, rabbit brush, shadscale, and salt sage. Growth of grass occurs heavily in areas that are characterized by poorly drained soils. The grass that grows in these areas includes salt grass, foxtail, and redtop and have a higher level of tolerance for alkaline soils. Alfalfa was becoming a more desirable crop to grow in the Uintah Basin as alfalfa is also more tolerant to poor quality soils. Alfalfa seeds had only recently become used for commercial value and because of this, alfalfa farming areas increased. It was reported that there were over 5000 acres of alfalfa being grown during this report. No plant rotation plan was exercised other than replacing alfalfa after five years with two crops of grain, followed by a year of corn, followed by more alfalfa. This practice did not effectively recycle nutrients back into the soil as would be recommended.

**Government Interactions in the Uintah River Valley Area, Utah 1920s:**

Mentioned in this report were that the state, county and reservation management were working hard to improve the quality of roads in this area. The roads which led to large cities in the Uintah Basin such as Vernal, Roosevelt, Myton, and Duchesne underwent considerable improvement through this funding. Because these roads became slightly more developed, commercial marketing

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31 Hendrickson, et al, 1496.
improved within the Uintah River Valley. However, it should be mentioned that marketing of commercial products such as beef, sheep wool, cream, and honey was still not very profitable. The cost of travel needed to carry these items to railroad shipping stations was still very high which made the margin for profit earned from these commodities very narrow. The development of the roads by state, county and reservation legislature did, however, help conditions of travel between local townships within the Uintah River Valley Area, if nothing else.  

**Concerns in the Uintah River Valley Area, Utah, 1920s:**

One of the concerns in the Uintah Basin in 1925 came from the over-inflation of the value of land acreage. In the early 1900s one acre of land in the Duchesne area was only $1.42, but when the quality of roads began to increase, so did the price of land. An acre of land in the Duchesne area in 1920 was now estimated at $26.19. The increase in cost for land usage also contributed to bankruptcy of the Uintah Basin. As was true for all of America during that time in the 1920’s, the Uintah Basin could not sustain itself financially because proper interest rates were never assessed on the land within the Uintah Basin, which led to tax evasion.  

The lack of paid income taxes slowly led to financial bankruptcy. Without suitable financial budgeting, the land within the Uintah River Valley area was becoming less regulated and much more susceptible to mismanagement.

**Uintah Basin, Utah, 1930s:**

In July 1936, The Uintah Basin Record reported that a soil survey which had been started by the Utah State Agricultural Experiment Station was to be completed by the soil conservation service. For the first time, the entire Uintah Basin was to be studied. Experiment station director Lowry Nelson explained, “If Utah is to continue to grow in population it will be made possible only through a wiser use  

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of existing resources.”\textsuperscript{34} The subsequent inter-agency report covered primarily Duchesne and Uintah Counties or 4,838,400 acres of measured land. The level basin ground had an estimated elevation of roughly 5,000 feet, and the highest portion evaluated (Uintah Mountains) had an estimated elevation of 13,000 feet.

This report evaluated privately owned land in the form of Indian lands and publically owned lands in the form of state or county owned land and national forests. A quote describing the land of the Uintah Basin mentions the following, “Almost every acre of the Uintah Basin has been subjected to considerable misuse since early settlement because of lack of supervision. Naturally, when lands can be grazed at any season and to any extent without cost of obligation, there is little thought given to their perpetuation.” \textsuperscript{35} This helps to describe the level of misuse that had been observed by researchers from years past as well as describe the overall trend in which the land of the Uintah Basin studied was heading.

**People of the Uintah Basin, Utah, 1930s:**

The Northern Ute families who resided in the Uintah Basin around this time period were actually fairly successful farmers. A few years prior to this report in 1938 it was noted that in 1931, Ute farmers produced 5,550 bushels of wheat and 5,666 tons of hay as well as owned 2,661 cattle and more than 14,000 sheep on the 63,000 acres that were owned by the Utes. During the year of this report the Utes started a cattle association as well. What is also interesting is that even with the Great Depression looming, the Northern Utes were given a sizable sum of money. In 1931, the Utes were given $1,207,221 in return for 973,777 acres that was used as land adopted into the Uintah National Forest.\textsuperscript{36} The Utes of

\textsuperscript{35} Lister, et al, 2.
\textsuperscript{36} Collins, 51-52.
the Uintah Basin in 1938 were largely responsible for the land that they managed, but faced the issue of complacency due to poor living conditions in the reservation.

The Anglo-Americans who occupied the Uintah Basin in 1938 were still very much dependent upon animal grazing for commercial success. We now realize that during this period, the poor quality of the soil within the Uintah Basin was dramatically affecting the production of grazing animals. The land of the Uintah Basin had been continuously exhausted for animal feed while the animals began to die at an increasingly fast rate. As mentioned in the report, “livestock kept on poor ranges suffer heavy death losses, sometimes amounting to 20 percent for sheep and 10 percent for cattle. While definite figures are not available for Uintah Basin, they are known to be high and to cut seriously into the income that may be derived from livestock.”

People were beginning to realize that the land needed to be more protected as continual use of the resources was reducing the success of Uintah Basin’s economy.

Soils of the Uintah Basin, Utah, 1930s:

What was being discovered with the soil in 1938 is that animal grazing had created serious erosion concerns throughout much of the Uintah Basin. In only 2 percent of the land not found on Indian Territory was there soil considered to be “normal or unaccelerated,” while over 10 percent of the land studied was so badly eroded that it was thought that the land would never recover from this loss. The largest contributors to soil erosion were freezing and thawing, wind, and gully erosion caused by excessive water flow. Water erosion is a major issue because the soil that is relocated by water is often organically rich and relocated to never be used again. It was estimated that due to water erosion, organic matter was lost at a rate of seven and a half tons per minute during the summer of 1936. Wind erosion relocates soil as well. What was happening was that the soil no longer had vegetative cover to

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37 Lister, et al, 8.
38 Lister, et al, 15-16.
protect it from these elements due to the destruction caused by animal grazing and was further creating poorer land within the Basin.

**Vegetation of the Uintah Basin, Utah, 1930s:**

As mentioned earlier, invasive plant species have been extremely prevalent in the Uintah Basin and led to increased erosion of the soil. Russian star-thistle had nearly reduced the former staples of grasses such as *Hilaria jamesii* and *Bouteloua gracilis* to extinction. Cheatgrass (*Bromus tectorum*) replaced areas of bluegrass and wheatgrass in sagebrush areas in the Basin. There was also a major drought in 1934 which further contributed to the loss of plant growth. It was reported that in 1934, perennial grasses declined to only 38 percent of the value reported in 1932.\(^{39}\) Entire vegetative communities were devastated during this period in Uintah Basin history.

**Government Interactions in the Uintah Basin, Utah, 1930s:**

Perhaps the greatest law that tried to protect the quality of the soil and land was the Taylor Grazing Act that was introduced by Congress in 1934. The Taylor Grazing Act sought to protect the land used for animal grazing by establishing a tax on the animals used. The tax, issued as an AUM (Animal Unit Month), was the amount of foraging plants necessary to feed “one cow and her calf, one bull, one horse, or five sheep or goats for one month.”\(^ {40}\) The Taylor Grazing Act was important in that it began to illustrate that the land should be more protected and ultimately paid for, if the law was to be utilized extensively. However, one of the shortcomings with this law was that the AUM prices did not make up enough in damage caused to the environment to be considered effective. The AUM tax, when introduced in 1936, was only five cents. The price of the AUM eventually rose, based upon the viability

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\(^{39}\) Lister, et al, 11-14.
\(^{40}\) McGinty, et al, 4.
of the land. Utah’s AUM later became 12 cents in 1941 when it was becoming clear that the price of the AUM was not earning sufficient revenue.

**Concerns in the Uintah Basin, Utah, 1930s:**

The major concerns regarding the quality of the soil resulted largely from the actions of overgrazing livestock within the Uintah Basin. The continual over-grazing resulted in depleted native vegetation, increases in invasive plant species, and heavy erosion of soils. There was, of course, still a concern on how to properly manage saline soil and water disposal. There were also some concerns regarding the “ceded” Indian lands between the Anglo-Americans and the Indians. Ceded lands were essentially unusable lands that were previously used as grazing areas in limited amounts. However, in 1938, the U.S. Government issued these ceded lands over to the Indians which created further turmoil over proper usage of the land between the two groups. Another rather large concern that occurred was the drought of 1934. The drought caused $17,000,000 worth of damage and affected nearly every portion of Utah. The 1930’s presented many concerns, but it was encouraging to see acts such as the Taylor Grazing Act trying to promote a balance of commercial business and sustainability of the Uintah Basin.

**Roosevelt-Duchesne Area, Utah, 1950s:**

The majority of the work on this soil survey report was performed in 1937, 1940 and 1954, finally getting published in December of 1959. The area of Roosevelt-Duchesne researched in this report covered much of the Northeastern portion of Utah within the Uintah Basin. The entire area in the report covered 644,914 acres and detailed the arable land within these boundaries. The Uintah Basin in which

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the Roosevelt-Duchesne report is located is situated along a geographical depression between the Uintah Mountains and the Tavaputs Plateaus. The highest elevation studied in this report was estimated to be around 13,500 feet above sea level while the lowest point is 4,655 feet. The average point of elevation for this soil survey report was 5,000-6,000 feet. It is important to understand that the highest elevation point in which crops were seen to grow was around 7,000 feet above sea level in Mountain Home. This report is unique compared to the previous soil reports in that the boundaries of the studied area of Roosevelt-Duchesne were established by aerial photographs; then cartographers further studied the boundaries from the aerial photographs. This as well as the 17 year period of study led to the most extensive soil survey report yet.43

People of Roosevelt-Duchesne Area, Utah, 1950s:

The Basin was in great economic decline in these years. One important event that happened in 1951 was that the Confederated Ute Tribes won a settlement from Colorado that appropriated the tribes $18 million. With this money the Northern Utes tried to fund an ongoing project known as the Uintah Indian Irrigation Project. This project was ideally created to control the waters used for proper irrigation practices on or near Indian Territory. However, this project used all the money earned from the settlement and left the Northern Utes in a poor position. In a confusing situation, the water produced from the irrigation project had to be paid for on an individual basis and members of the Ute

tribe could not pay for their own water developed in this project.\textsuperscript{44} Because of this, the territory of the Northern Utes was not sufficiently tended to, and farming declined among the Northern Utes.

The Anglo-Americans during this period purchased individual rights to use the water developed from the Irrigation Project. They were still reliant on farming in the Uintah Basin in the 1950’s. The major commodities included cattle, beef, sheep, lambs, horses, honey, wool, butterfat, and clover seed.\textsuperscript{45} The non-Utes had more access to the water from the Utes and there was still great unrest between those populations. The entire Basin was in economic decline in regards to agriculture and farming. The non-Utes as well as the Northern Utes within the Uintah Basin suffered greatly. Finding employment was an issue for both groups. Issues of land and water rights, land access, government sanctions, and the “... depressed economy of the Basin... placed whites and Indians in direct competition for its limited resources and jobs.”\textsuperscript{46}

Soils of Roosevelt-Duchesne Area, Utah, 1950s:

The soils within the Roosevelt-Duchesne area were classified into five principal soil categories. The first group is the Naples, Billings Fruita group which mostly occurs on alluvial fans and is considered to be the most arable of the soil groups. The second group is the Mesa, Neola, and Avalon soils which are found on sloping areas and have a large accumulation of lime carbonate. The third group is called Ashley, Myton and is found in low, gravelly river terraces. This soil is unique in that it can absorb great amounts of water. The fourth group is known as Shavano, Chipeta, Montwel soil and is located in deeper soils of bedrock sediments and is also known to be poor for growing crops. The final soil category is Rough lands, which is made from different rough soil materials and does not contain true soil, and thus, has little value agriculturally. The five soil groups were categorized based on elements such as the soils

\textsuperscript{45}Wilson, et al, 3.
\textsuperscript{46}Collins. 28.
color, texture, structure and consistency. All of the soils face alkalinity usually associated with excessive water seepage and poor soil drainage. Most of the soils studied are low in nitrogen and humus but contain large traces of minerals.

**Vegetation of Roosevelt-Duchesne Area, Utah, 1950s:**

The native plant vegetation that has been observed in the Roosevelt-Duchesne area includes a wide variety of shrubs and grasses that are suited for arid regions. Some of the vegetation includes sagebrush, saltbush, alkaliweed, snakeweed, povertyweed, Russian-thistle, and greasewood. Sagebrush is the most common shrub found in most of this region. Some vegetation thrives in areas with alkalinity and poor water drainage. Some of these plants are saltgrass and reedgrass. Invasive weeds have become much more common along the Uintah Basin; some of the most notorious offenders include Russian-thistle, alkaliweed, and povertyweed. These weeds out-compete much of the native vegetation which already is at a disadvantage by facing alkalinity issues and poor irrigation. The most common commercially grown crop in the Roosevelt-Duchesne area has to be alfalfa. Alfalfa has always been important in the history of the Uintah Basin due to its ability to somewhat resist alkaline soils. Alfalfa is also useful as animal feed. Alfalfa yields have dramatically declined since some of the early reports from the 1920’s, but alfalfa is still grown on 75 percent of the usable cropland in this area.

**Government Interactions in the Roosevelt-Duchesne Area, Utah, 1950s:**

Mentioned earlier, one of the dramatic government actions that occurred during this period was the settlement that the Northern Utes won from the state of Colorado in the Confederate Ute Tribes settlement which netted the Northern Utes $18 million. The money earned from this settlement was used to fund the Uintah Indian Irrigation Project which attempted to develop a more efficient irrigation

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system to aid with soil quality and overall agricultural productivity. After this project began to develop, the Northern Utes and the white settlers began to argue over proper rights over water from this irrigation system. The Northern Utes and the white settlers have been arguing over water rights basically since the act was established. Water rights became a very delicate subject between the two groups ever since.

Another government act that occurred during this period involved an alteration of the Taylor Grazing Act established in 1934. The Bureau of Land Management (BLM) increased the grazing fee from eight cents to twelve cents to fifteen cents by 1957 for the right to graze animals on public land. The purpose of the Taylor Grazing Act was established to try and limit the amount of animal grazing on public land by issuing a tax to raise “one cow and her calf, one bull, one horse or five sheep or goats for a month.”

Recognizing that the tax issued from the Taylor Grazing Act was too small to cover the cost associated with degradation to the soil and farmland, the increased tax tried to alleviate the amount of degradation. It seems that government officials did not know how to handle this situation of degradation to the soil as the price began to increase over time with greater exhaustion of the land.

**Concerns in the Roosevelt-Duchesne Area, Utah, 1950s:**

Along with the usual concerns associated with the soil, which include, overgrazing, lack of regulation, invasive weeds and alkaline soil, more concerns were beginning to be found after years of study and research of the land. One of the new concerns that arose was that the white settlers of the Uintah Basin were beginning to relocate to areas away from the Uintah Basin. This became a problem because the soil was very poor and eventually led to harsh economic times in the Uintah Basin. After the Great Depression and exhaustion of the land, the younger generation settlers sought opportunity

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elsewhere and abandoned the poorly managed Uintah Basin area, leaving it to the Northern Utes.\textsuperscript{50} The Northern Utes did not relocate from their reservations and suffered from the aftereffects of poor soil management by these settlers.

Another issue that was explored was the effect that irrigation water was having on soil in 1953. The Utah Agricultural Experiment Station began to perform experiments that examined the problem. Because irrigation water had trace quantities of soluble salts, efforts were made to try and devise techniques to limit the amount of salts that found their way into Uintah Basin soils. One of the more successful methods that was adopted from this study was the introduction of chemically altered fertilizers and manures. Another discovery that limited the amount of soluble salts infiltrating soil was crop rotations and cover crops. Cover crops allowed more beneficial nutrients into the soil as well as provided protection from weather and erosion.\textsuperscript{51} While soil management was becoming more understood, implementing cover crops and fertilizer was not always executed by farmers of this period.

**Conclusion:**

The efforts to manage soils within the Uintah Basin from 1920 to 1959 were extensive. The major concerns regarding soil health involved alkaline soil, heavy erosion, usable irrigation water, waterlogging invasive weed species, degradation of cover crops, and animal grazing. Issues about management of the soil, water, and the land in general were always complicated by the differing techniques of land use used by the Utes and Anglo-Americans. Poorly represented politically and increasingly outnumbered, the Utes often fell victim to the exploitation of their lands by commercial livestock grazing and irrigated agriculture. And although researchers in the early twentieth-century

\textsuperscript{50} Collins, 20.
raised concerns about the increasingly damaged soils, most people in the Uintah Basin did not act to protect these resources.

Further research recommended methods for maintaining healthy soils: fertilizer implementation, rotation of crops, cover crops, and proper irrigation practices. Some of these methods have been implemented in the Basin, particularly since the 1960’s. The complicated quarrels between the Utes and non-Utes regarding land and resources has never been entirely resolved. And the soils within the Basin are continuously harmed by further exploitation even to the present day. Soil quality effects an entire web of consequences that we need to understand if we hope to create any form of local or global sustainability. I think Franklin D. Roosevelt expressed well the significance of good soil management: “A nation that destroys its soils destroys itself.”\textsuperscript{52} It needs to be more universally understood that we need to protect our soils today and tomorrow.

\textsuperscript{52} Franklin D. Roosevelt, Letter to all State Governors on a Uniform Conservation Law, February 26, 1937, The American Presidency Project, \url{http://www.presidency.ucsb.edu/ws/?pid=1573}
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