SOIL SURVEY OF THE LEWISTON AREA, IDAHO.

By LOUIS MESMER.

LOCATION AND BOUNDARIES OF THE AREA.

The Lewiston area covers about 308 square miles, or 197,248 acres, extending from Lewiston, the county seat of Nez Perces County, northward to Moscow, the county seat of Latah County. The greater

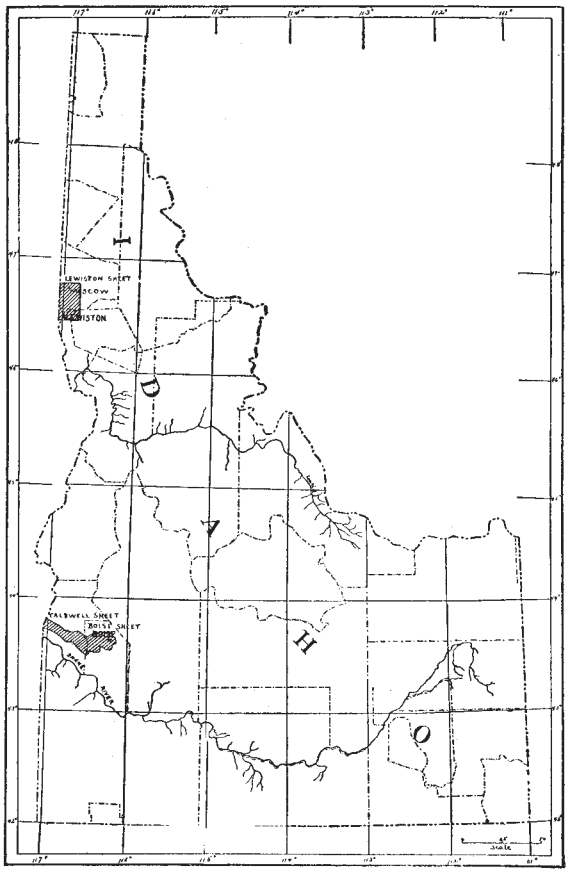

FIG. 21.—Sketch map showing areas surveyed in Idaho.

part of the area surveyed lies within Latah County, a small portion of Washington State being included along the western boundary. Within the limits of the survey are embraced a typical section of the famous Palouse wheat country and, in the vicinity of Lewiston, an important irrigated orchard district. (See fig. 21.)

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The news of the discovery, early in the sixties, of rich gold deposits on the Clearwater River caused a great rush of miners and prospectors, many of them gold seekers returning from California, to this part of Idaho. They came in principally by way of the Snake River, stopping at the head of navigation—the junction of the Snake and Clearwater. Here a typical mining town of tents and cabins was rapidly built, which soon became headquarters for mining supplies, attaining at the height of mining prosperity a population of about 5,000.

By the end of the sixties, however, most of the profitable gravel beds had been worked, yielding, it is said, in the neighborhood of $150,000,000 worth of precious metal. There was then little left to hold the miners and the field was shortly deserted, only to be taken up by Chinamen, who continue to work the old placer deposits to this day. With the decline of mining the population of Lewiston (named in honor of the first explorer, leader of the Lewis and Clark expedition) rapidly decreased, a few hunters, trappers, and prospectors soon constituting the community.

About 1874 the first important steps toward agriculture were taken on low-lying, easily irrigated lands along the Clearwater River. The large yields of crops and the prices received for the products were very encouraging and cultivation gradually extended to the uplands. These were covered with great quantities of bunch grass, furnishing abundant pasturage for roving herds of horses and cattle. Here the virgin lands gave much larger returns than anticipated, equal, if not superior, to those given by the Walla Walla country, just over the divide to the west, which was then well under cultivation. Only a short period elapsed before the success which attended the upland experiment was made known to the people of Oregon and Washington and there followed the first important influx of settlers, coming chiefly from those States. By 1880 reports of the phenomenal grain yields of the region had been carried to Kansas, Missouri, Illinois, Wisconsin, and other more eastern States, and settlers then came in so rapidly that by 1883 all the best lands had been taken up and put under cultivation.

This rapid extension of the cultivated area narrowed down the stock ranges and forced the herds into smaller areas, with the result that the grass was cropped too short, most of it was killed, and stock raising on a large scale rapidly declined. Small herds were, however, retained by many, being fed during the winter, and either pastured during the summer on home pastures or driven to the mountains.

Up to 1883 the grain crop was largely consumed in the immediate vicinity and on the Indian reservation, but, with the greatly increased acreage, yielding of wheat 45 bushels, of barley up to 105 bushels, and of flax from 18 to 35 bushels per acre, very large shipments had to be made. These were sent down the Snake River to the Portland

market. The question of transportation to market was a serious one to those living remote from the river, and profits were dependent in a great measure upon the distance of the producer from the head of navigation.

Attracted by the remarkable fertility of the soils and the wonderful production of grain, a railroad was laid in 1887 to Genesee, resulting in increasing the profits to the farmers in its vicinity and raising the value of land from $10 to $15 and $18 per acre.

With the advent of the railroad also came the introduction of improved stock. Fine horses of the Shire, Belgian, and Clydesdale breeds were brought in, and also beef cattle, principally of the Durham and Hereford breeds. The improvement of live stock was marked and rapid.

Up to 1890 spring wheat had generally been grown, and that on the same ground year after year. The superiority of the hard winter wheat when grown in the area was then discovered, and the increased yield and better quality of grain produced on lands allowed to lie fallow for a season was also observed. These discoveries brought about a change in the agricultural methods, resulting in the substitution of winter for spring wheat and the practice of summer fallowing.

The entire failure of the grain crop in 1893 turned the attention of many grain growers to the handsome profits realized by orchardists along the Clearwater River, and many prune, apple, pear, plum, and other fruit trees were set out on the uplands. These orchards grew well, but the season was found to be too short to permit the perfect development of fruit, excepting apples, cherries, and some varieties of pears. The new industry was therefore not attended with the profit expected, and production is limited mainly to home supply.

The opening of the Nez Perces Indian Reservation to settlement in 1895 forms another important event in the development of this country. The Indian lands were rapidly taken up, furnishing homes for about 3,000 families. This greatly increased the grain output and brought the section into greater prominence. The large area farmed on the reservation resulted in an extension of the Northern Pacific Railroad, which in 1898 was laid through Moscow to Lewiston.

The crop production of the Lewiston area has fluctuated considerably with the seasons, and the prosperity of the farmers with the varying price of grain, which during the financial depression of 1893–94 was extremely low. The seasons since 1897 have all been good, and during this period the country has made great and steady advancement along all the various lines of industry.

CLIMATE.

The climate of the Lewiston area is characterized by low humidity, moderate wind movement, and a long, dry summer, the greater portion of the rain falling between the 1st of November and the last of

May. The summer temperature for the lowlands lying along the Clearwater River is quite high, but that of the greater part of the area, situated in the same plateau with Moscow and Genesee, is exceptionally pleasant, with mild days and cool nights.

The following table gives the normal monthly and annual temperature and precipitation at Lewiston and Moscow, the figures being taken from Weather Bureau records for the past eight and nine years, respectively:

Normal monthly and annual temperature and precipitation.

Month.	Lewiston.[a]		Moscow.[b]	
	Temperature.	Precipitation.	Temperature.	Precipitation.
	° *F.*	*Inches.*	° *F.*	*Inches.*
January	35.5	1.30	29.0	2.98
February	38.4	1.18	31.2	2.71
March	43.6	.78	36.8	1.94
April	53.1	1.02	45.8	1.60
May	60.4	2.03	52.7	2.37
June	65.8	1.09	58.1	1.36
July	74.4	.44	66.8	.49
August	74.7	.57	65.0	.86
September	62.3	1.00	57.2	1.35
October	53.8	1.42	47.9	1.79
November	42.5	1.84	36.7	3.21
December	37.4	1.27	32.2	2.56
Year	53.5	13.94	46.6	23.22

[a] Elevation 757 feet. [b] Elevation 2,569 feet.

An inspection of the foregoing table will reveal decided differences between the temperatures and precipitations of Lewiston and Moscow. This is due to the difference in elevation, Moscow being about 2,000 feet higher than Lewiston. As the greater part of the area lies in the same plateau with Moscow and has about the same elevation, the data given for this station may be taken as fairly typical of the section, while that for Lewiston represents the conditions in the territory south of the Clearwater River and in a small section along the north bank.

The general conditions of the two sections, lowland and upland, may be summed up in a few words. The latter has mild summers, moderately cold winters, snow seldom remaining for any length of time, and abundant rainfall, the complete failure of ordinary crops for lack of moisture being unknown. The former has warm summers, moderate winters, zero weather being the exception, and a normally light rainfall, the ordinary field crops suffering occasionally for lack of moisture.

PHYSIOGRAPHY AND GEOLOGY.

In describing the present relief of the country under consideration it may not be amiss to give a brief description of the topography of the original land surface, the subsequent intrusion of the lava, and

the different agencies which have since been brought to bear and to which the present topography owes its existence.

The original topography was widely diversified, consisting of a much denuded land surface, where schist, diorites, and other igneous rocks that were formed many feet below the earth's crust and brought to the surface by the active agency of erosion predominated. Fissures in the earth's crust gave forth immense volumes of fluid magma which spread over the then existing surface, gradually filling up the depressions and modifying the relief. Over an area of several hundred square miles in eastern Washington the lava has been eroded away, laying bare the rock on which it originally rested. Here hundreds of dikes of dense basalt, ranging in size up to 150 feet in thickness, may be seen. Many other dikes of this character undoubtedly exist over the area, and, as erosion and denudation goes on, will be brought to the surface. An idea of the enormous volume of lava poured out in forming the Columbia River lava field, which is such an important physiographic feature of the Northwest, and in the eastern extremity of which the area surveyed lies, may be had from a brief description of its dimensions. It extends from the Bitter Root and Cœur d'Alene Mountains in western Idaho into Washington and Oregon, where it covers nearly the whole area east of the Cascades. It embraces a territory over 200,000 square miles in extent, estimated by Russell to contain 50,000 or 60,000 cubic miles of lava. (U. S. Geological Survey Water-Supply Paper No. 54, p. 54.)

Exposures in some places show it to be 4,000 feet thick, while within the area under consideration deep lateral canyons leading into the Clearwater River lay it bare for at least 2,000 feet in depth. Intervals of time between the different outflows of lava are recorded by the sedimentary and other deposits which occur between the lava sheets. These contain silicified trees and other flora which grew on a land surface formed either by the deposition of sediment or the disintegration of the lava layer on which they are found.

The land surface after the extrusion of the last lava sheet was what might be termed a bare and almost featureless plain, the range of hills to the south of Moscow standing alone in the sea of molten rock. The surface of the lava was undoubtedly similar to investigated areas of more recent date—scoriaceous, slaglike, slightly undulating, and cracked, the disfigurement being brought about by the contracting of the lava in cooling. Since this period movements in the earth's crust, together with the action of the elements, have to a great extent destroyed its uniformity.

Beginning at a point about 4 miles south of Genesee a downward movement or general subsidence of the land surface took place and brought about what is now known as the Clearwater escarpment. The huge conformable layers of lava were gradually bent in a southerly

direction into a monoclinal fold. The dip of the layer is very abrupt, approaching in places 40 degrees. At the base of the escarpment the fold gradually flattens out and passes under the town of Lewiston. The base of another monoclinal fold, extending in an easterly and westerly direction, also passes through Lewiston. This, however, is not as pronounced as the Clearwater escarpment, the greatest dip of the layers probably not exceeding 2 degrees. Next in importance to the movements of the earth's crust in an arid region are the elements which wear away the land surface, gradually reducing it to sea level. The most active eroding agent within the area surveyed, the Clearwater River, enters a little above the southeast corner of the area and flows in a westerly direction directly along the fold or escarpment previously described. It has cut a valley a mile or more in width, the south bank of which in the east is bordered by almost perpendicular bluffs hundreds of feet in height. Westward, following the dip of the layers, the bluffs gradually decrease in height, disappearing entirely at Lewiston. The north bank throughout its entire course is about 2,000 feet high and is very steep, standing out in bold relief. It is cut by numerous canyons and small streams which drain the plateau.

With the weathering of the rock surface the small streams gradually carried away the finer material. In time small channels were eroded along the line of greatest fall, and as their courses were deepened small valleys and intervening ridges were developed. On the broad plateau rock, weathering was in advance of erosion, probably due to a light rainfall, and rock powder accumulated to a great depth. It is fine in texture and acts as a ready absorbent of water. At present a very large proportion of the rainfall is absorbed, and many of the drainage channels remain dry throughout the year. The plateau in which Genesee and Moscow are situated now stands covered with an endless succession of small valleys and ridges. The difference in elevation between the bottom of the valleys and the crests of the hills varies from 50 to 150 feet, with an occasional difference of 200 feet. They are covered, except in exposed elevations, with a deep and pervious soil. Along the Clearwater River erosion has been much in advance of rock decay. Small streams, the most important of which on the north side is the Little Potlatch, and on the south side Lapwai Creek, flow down steep gradients, cutting deep and often precipitous channels, the heads of which are gradually working inland.

Along the canyons landslides, favored by the structure of the basalt, have greatly increased the eroding power of the streams. Immense blocks give way from the precipitous walls, slide down and lodge along the slope or, occasionally, in the bed of the stream, by which they are then gradually carried away.

The physiographic features of the area may be summed up as follows: The Uniontown Plateau, a rolling prairie about 3,000 feet high, with

an irregular "steptoe," lying south of Moscow, stands several hundred feet above all, from the highest point of which the greater part of the area may be seen. The southern boundary of the plateau terminates in a bold escarpment dissected by small streams, directly along the base of which flows the Clearwater River. South of the river lies the Lewiston Plateau, only a small part of which was included in the survey. It has an elevation in some places as great as 1,500 feet, and though less rolling than the Uniontown Plateau, it is deeply dissected. Along the Clearwater River and some of its tributaries small sedimentary deposits are formed. These occur in the form of terraces, the most conspicious of which is the bench where the new town of Lewiston is being built, standing some 100 feet above the river.

Lithologically the rocks of the area can be divided into two sharply defined groups—an older and younger—differing widely in origin and character. The older occupies an irregular, islandlike area, several square miles in extent, in the lava field, extending from a point a little to the east of Moscow in a south and southwesterly direction, together with several comparatively small exposures laid bare in the canyons by the eroding agency of the streams which drain from the plateau. The group is made up of a large variety of rocks of pre-Tertiary origin, granites, schists, and light-colored igneous rocks predominating. No attempt has as yet been made toward systematic quarrying, and it remains to be seen whether they have any economic value.

The action of the elements has a varied effect on the different surfaces, the weathering of the mica schist and similar soft rocks being in advance of the close-grained granites. All, however, finally break down into a comparatively light-colored soil of no more than average fertility.

The younger group consists of Columbia River lava, together with the sedimentary deposits, lapilli and volcanic dust, which occur between the lava sheets. It unconformably overlies the older group, no great deposits of loose material being found between the two. At the extrusion of the last sheet of liquid magma the lava covered the entire area, with the exception of the high area previously referred to. This "steptoe" (as Russell suggests areas of this description should be termed), has since increased in extent by the gradual eroding away of the surrounding lava.

As determined by J. S. Diller, the lava is a typical basalt, containing plagioclase, olivine, and magnetite, with some globulitic base. The central portions of the layers are close grained, very dark in color, and where exposed exhibit the characteristic columnar structure, while the surface is usually scoriaceous, occasionally of a reddish color, filled with blebs, and often lacking in the characteristic structure of the true basalt. The reddish color is found in all degrees of intensity, and is due to oxidation of the iron.

The value of the basalt as a building stone may be mentioned. Its use, however, on account of its dark color, is confined to foundations, etc. As a material for making roads it is excellent, and great quantities may be expected to be used for that purpose in the future. The rock is rich in materials containing iron, lime, phosphoric acid, and potash, and weathers into a deep, dark, uniformly textured soil of remarkable fertility.

The beds of lapilli, found between the basaltic layers, were formed by the encroaching of molten lava on bodies of water, the rock being shattered by the steam generated, or possibly the water was separated into its component parts and the explosion resulted from the ignition of the two elements. The fragments are about the size of small gravel, angular in shape, and have generally a scoriaceous or glossy surface. Volcanic dust commonly occurs in light gray layers that owe their origin to some distant volcano. The material is exceedingly fine and seems to have floated a long distance in the atmosphere, being deposited over a large area. In the layers of ash are preserved fossils of the flora existing at that time. These have been classed with known Tertiary plants, and the lava must, therefore, have been extruded during the Tertiary period, and consequently the underlying rocks of the older group must be pre-Tertiary.

Where strata of considerable thickness are found they are quite compact and may prove to be of value as a building material. Analysis of the volcanic dust by Hildebrand shows it to be richer in silica, soda, and potash than the soils of the plateau. Since evidence of showers of comparatively recent date are found, it is quite probable that plant food may have drifted in and spread over the area in the form of ash.

The sedimentary gravel, sand, and clay beds owe their origin to the surrounding mountains, from which they have been carried down by streams and either deposited along their course or in the ponds and lakes that existed over certain portions of the lava field. Like the ash, the sedimentary beds not infrequently contain fossils of plants existing at the time of deposition.

The porous layers of gravel, sand, lapilli, etc., have an important bearing on the water supply of the area, as they form ducts or passages for the movement and storage of ground water which supplies the wells.

SOILS.

The soils of the area are some of them residual and some alluvial. The former are the most important, as they are the most extensive, covering the greater part of the area. They are the result of the weathering and disintegration in place of crystalline or igneous rocks, principally trappean basalt. The trappean rocks break down into the more fertile soils. The alluvial soils are composed either of the fine sediments washed from the surrounding hills of the plateau and laid

down in the intervening valleys or else of material picked up by the Clearwater River and carried down and left in narrow benches or terraces along its course.

Areas of different soils.

Soil.	Acres.	Per cent.
Yakima fine sandy loam	172,992	87.7
Yakima silt loam	15,936	8.1
Yakima sandy loam	6,208	3.1
Yakima fine sand	2,112	1.1
Total	197,248	.....

YAKIMA FINE SAND.

The Yakima fine sand consists of a light-brown, gray, or ash-colored sand ranging from almost pure sand to a light sandy loam, having a depth of at least 3 feet and not uncommonly 6 feet, underlain by a coarse sand or gravel. It occupies small, low, level terraces or benches along the Clearwater River, and on account of its loose, incoherent nature is in every case easy to till. The soil represents the weathering of blended alluvial deposits derived from the volcanic, crystalline, and other allied rocks that occur along the Clearwater River. It is characterized by a high percentage of muscovite mica.

A special phase of this soil is a light-brown sandy loam 12 or 15 inches in depth, underlain by a lighter colored, sandier soil, which in turn runs into sand and gravel. This phase occupies a small upland mesa or terrace in the extreme southwestern corner of the area and is largely occupied by the city of Lewiston. In digging holes for telegraph poles in this area a white calcareous hardpan was encountered at a depth of 4 feet. This hardpan has a thickness of from one-half to three-fourths of an inch and offers very little resistance to the auger. When exposed to the weather for a few days it crumbles in the hands like an ordinary compacted loam. When the depth below the surface, the slight thickness of the stratum, and the soft nature of the material composing it are considered, this hardpan is of little or no consequence as affecting agriculture.

The location of the areas of this soil in a comparatively narrow valley, or perhaps more properly a canyon, between rolling plateaus, the north slope or wall of which culminates in hills in the neighborhood of 2,000 feet above the valley, gives it a protected position, inducing an early season and a prolonged summer climate—special advantages where fruit culture is the chief interest. As a result of the composition and favorable situation, when irrigation water is applied the soil gives wonderful yields, and such land with good water supply is held as high as the best lands of similar character in southern California.

Deciduous fruits, including peaches, cherries, plums, prunes, apricots, pears, apples, and grapes, grow rapidly and, with few exceptions, bear well. Of the fruits mentioned, peaches, cherries, plums, and table grapes are said to be the most profitable. The soil is also specially adapted to the production of small fruits and truck. Cantaloupes and melons yield abundantly and are of fine quality, while many other truck crops can be made to produce two or more crops on the same ground in a single season.

The following table gives mechanical analyses of the soil and subsoil of the Yakima fine sand:

Mechanical analyses of Yakima fine sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
7524	1 mile E. of Lewiston.	Fine light-brown sand, 0 to 48 inches.	1.17	0.04	0.40	0.84	26.76	38.40	29.18	4.34
7523	3 miles E. of Lewiston.	Fine sand, 0 to 40 inches.	1.36	.10	1.34	3.20	29.32	29.40	30.04	6.20
7690	Lewiston	Light sandy loam, 0 to 15 inches.	.83	.18	2.20	5.76	24.70	22.52	37.50	6.42
7691	Subsoil of 7690.....	Light sandy loam or sand, 15 to 36 inches.	.12	.08	1.74	5.88	26.66	24.70	32.92	6.72

YAKIMA FINE SANDY LOAM.

The surface soil of the Yakima fine sandy loam consists typically of a friable brown sandy loam with an average depth ranging from 10 to 16 inches. There is, however, a variation in depth, color, and texture according to location. On the sharp hills, steep slopes, and points the soil is shallower, lighter textured, and lighter colored than on the more gentle inclines, the tops of broad, rounded hills, or the depressions that occur at the base of slopes, where greater amounts of organic matter have accumulated. The subsoil consists of a light-brown silty loam, much heavier and more compact and plastic than the surface, affording good storage for moisture during the dry season. The subsoil has been brought to the surface in a number of small tracts, ranging in size up to one-half acre, or possibly an acre, by side-hill plowing. When thus exposed it has the characteristic adobe tendency to crack open when dry, and consequently is less retentive of moisture than the sandy loam with which it was originally covered. Spots of this description can be easily singled out in the grain fields, the crop on such areas being lighter and maturing in advance of the rest of the field. In many places where cuts or exposures occur a very distinct line of demarca-

tion between the surface and subsoil is seen. This line is occasionally as much as one-fourth of an inch in thickness, of a sandy nature, and of a gray or ash color. Below it the soil cracks and crumbles up cubically. The maximum amount of clay in the subsoil was encountered at a depth of from 33 to 40 inches. Below this the soil gradually gets lighter, grading into a fine sandy loam of a yellowish cast of color.

This soil type occupies a large area, and, as stated, there are some local variations. One such phase begins at a point about 4 miles south of Genesee and extends to the southern boundary of the plateau. In this area both the soil and subsoil are slightly lighter in color and in texture. This sandy nature of the soil makes it less retentive of moisture, especially along the immediate boundary line of the plateau. The crops therefore mature earlier and the harvest season sets in here a little in advance of the areas lying to the north. South of the Clearwater River another area occurs, in what is known as the Lewiston Plateau. Here the soil is lighter in color and quite sandy, even more so than in the area south of Genesee. The subsoil is a light-yellowish loam, having the same characteristics as the true type; i. e., cracking and crumbling like adobe. The rainfall here is less certain, and in seasons of shortage crop failures result. A light-colored variation is found east of Moscow and south around a portion of the area of Latah sandy loam, and in several small tracts along the Little Potlatch Creek. This area is not as fertile as the typical soil, and grain yields are lighter.

Along the canyon walls, where the soil, due to steep declivities, is quite shallow—in places there being little but bare rock or loose fragments that have broken from the more exposed places, rolled down, and crumbled over the surface—a sandy phase exists. All the areas of this description occur along the Clearwater River or its tributaries. They are of little value and are used only as pastures.

In general the surface of the Yakima fine sandy loam consists of the rolling hills and intervening depressions of the plateau. The soil has been derived from the deep weathering of trappean rocks, which are principally basalt. This weathering not uncommonly reaches a depth of 30 feet. This thoroughly decomposed rock material, with the slowly added accumulation of humus, has resulted in a dark-colored, fertile soil, the most extensive and important type in the area. An exception to the usual origin is seen in the light phases above mentioned, which owe their origin largely to igneous rocks.

Hardpan rarely occurs in this soil. A few specimens, however, were collected between Genesee and the edge of the plateau and sent to the laboratory for examination, where they were found to be the lime carbonate variety, a mixture of lime and magnesium carbonate. The very limited distribution of the hardpan and the thinness of the stratum where it does occur make its occurrence of little consequence. On the Lewiston Plateau gypsum crystals were often encountered in

making the borings. Usually these came from a depth of about 4 feet. Alkali salts were also occasionally observed, crystallized out on the banks of the drains. As the drainage of the soil on the plateau is good, there would be very little danger of the accumulation of alkali to such an extent as to be injurious to ordinary crops, even if irrigation water should be applied.

Wheat is the staple as well as the principal crop raised on this soil. Large yields are often secured, 45 bushels to the acre being recorded. The average yield, however, is probably about 30 bushels per acre. Oats and barley also give phenomenal yields. Sometimes as much as 70 or 80 bushels to the acre are obtained, the average being above 40 bushels. While flax is not grown as extensively as the cereals, it does well and gives an average yield per acre of 15 and occasionally 20 bushels. For corn, beets (mangels and sugar beets), and some varieties of potatoes the season on the plateau is too short, frost occurring as early as September 1. Small truck gardens, to supply domestic needs, do well and furnish all the essential vegetables. Orchards, generally about an acre in extent and consisting principally of apples and cherries, furnish large quantities of superior fruit. The berries, including raspberries, gooseberries, currants, etc., thrive and yield large crops of fine-flavored fruits.

The following table shows the texture of typical samples of the soil and subsoil of this type:

Mechanical analyses of Yakima fine sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
7489	2 miles E. of Moscow.	Light-brown fine sandy loam, 0 to 14 inches.	1.57	0.04	0.30	0.28	1.40	9.32	77.92	10.74
7492	9 miles E. of Lewiston.	Loose fine sandy loam, 0 to 14 inches.	2.06	.00	.08	.10	2.12	7.94	78.62	10.98
7494	5 miles N. of Genesee.	Fine sandy loam, 0 to 16 inches.	1.61	.12	.26	.18	.76	4.84	79.78	13.22
7497	½ mile E. of Genesee.	Fine sandy loam, 0 to 13 inches.	1.83	.22	.38	.26	.62	2.98	81.64	13.72
7493	Subsoil of 7492.....	Fine sandy loam, 14 to 72 inches.	.65	.00	.28	.30	1.38	10.24	81.46	6.34
7495	Subsoil of 7494.....	Compact loam, 16 to 36 inches.	.50	.12	.76	.80	2.06	3.32	84.50	7.88
7499	Subsoil of 7497.....	Fine sandy loam, 41 to 72 inches.	.24	.24	.34	.34	1.56	11.46	75.54	9.54
7490	Subsoil of 7489.....	Loam, 14 to 40 inches.	.51	.02	.32	.26	.68	7.62	80.16	10.90
7498	Subsoil of 7497.....	Brown loam, 13 to 41 inches.	.75	.10	.26	.22	.52	1.90	78.56	18.30

YAKIMA SANDY LOAM.

The surface soil of the Yakima sandy loam is a friable brown sandy loam, with an average depth of about 24 inches. This depth, however, varies greatly, depending entirely upon the location. On hills of gentle slope the soil mantle is deep, and on the more exposed locations it is quite shallow, in a few places there being but a slight covering over the fresh rock in place. The subsoil of the greater part of the area is a light-brown loam, considerably heavier and more compact than the surface soil, grading into decomposing crystalline rock. Rock fragments are encountered occasionally in the surface and not uncommonly in the subsoil.

This soil type occupies an area of high hills, several square miles in extent, lying between Moscow and Genesee. The rocks that form the hills are crystalline, and the soil is residual and derived from these rocks. The general elevation of this area is considerably above that of the surrounding basaltic plateau, while the maximum elevation is probably 500 feet above.

The physiography of the area is comparatively rough, and on this account much of the land has comparatively little agricultural value.

In its virgin state the soil usually supports a growth of yellow pine. Some of the more favorably located areas have been cleared and planted to wheat, oats, and flax. Some fair results are reported. The average yield per acre of wheat is about 25 bushels and of flax 12 bushels. Several small apple, prune, and plum orchards have also been set out, but the apple is the only fruit giving encouraging returns.

The following table contains mechanical analyses showing the texture of the soil and subsoil of this type:

Mechanical analyses of Yakima sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P.ct.*
7503	1 mile S. of Joel.....	Brown sandy loam, 0 to 30 inches.	2.22	0.86	1.04	0.42	1.20	5.52	79.32	11.50
7501	3 miles SE. of Moscow.	Brown sandy loam, 0 to 24 inches.	2.03	4.36	7.30	3.70	7.54	9.54	51.54	15.70
7502	Subsoil of 7501.....	Brown sandy loam, 24 to 72 inches.	1.01	.00	.54	1.76	6.90	13.78	70.42	6.42
7504	Subsoil of 7503.....	Brown loam or sandy loam, 30 to 72 inches.	.80	.00	.16	.20	2.96	13.80	72.48	9.64

YAKIMA SILT LOAM.

The Yakima silt loam consists of a grayish-blue, brown, or black loam ranging from a fine sandy loam to a heavy silt loam, having an average depth of about 10 inches, and underlain by a dark-gray or bluish adobelike loam that cracks and crumbles cubically when exposed to the weather. This in turn is underlain by a lighter soil, occasionally of a yellowish cast, containing in places, especially along the main drainage lines, sand in sufficient quantities to permit the free movement of ground water.

The Yakima silt loam occupies many of the local valleys, depressions, and necks between the hills of the plateau. The surface is generally quite level.

This soil type is the result of weathering of sediment washed principally from the hills composed of the Yakima fine sandy loam, but in part it is derived from wash from the Yakima sandy loam. Where the slightest fall exists the finest sediments have been deposited, and the soil is, therefore, quite heavy and is very wet during the winter season, water occasionally standing on the surface. This is a serious drawback to cultivation, as it makes the land late and cold. Drainage, preferably by the use of underground tile drains, would in such cases be beneficial.

Wheat is the most important crop. The average yield is better on this soil than on the Yakima fine sandy loam. The crop next in importance is timothy, which does better on this type than on any other soil in the area, and gives a large cutting annually. Barley and oats, like wheat, give yields above the average. Hungarian brome-grass (*Bromus inermis*) and alfalfa also grow well. The former is rapidly being substituted for timothy on account of its drought-resisting, hardy nature and heavy yield. In the pasture tall meadow oat grass, orchard grass, meadow fescue, and redtop give good results. In general the soil is best adapted for pasturage and gives a higher grain yield than any other soil in the area, but it is not suitable for orchards or cultivated crops requiring a long growing season in which to mature, as it is the last to warm up in the spring and the first to be affected by frost in the fall.

The table on the following page gives mechanical analyses of the soil and subsoil of this soil type.

Mechanical analyses of Yakima silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
7509	1½ miles E. of Moscow.	Gray silty loam, 0 to 11 inches.	2.25	0.50	0.80	0.48	1.76	7.20	80.66	7.48
7513	2½ miles S. of Genesee.	Heavy silty loam, 0 to 10 inches.	1.62	.34	.74	.54	3.14	13.04	68.38	13.50
7505	5 miles N. of Genesee.	Gray silty loam, 0 to 9 inches.	4.49	.66	4.48	3.22	6.84	3.54	55.88	25.38
7510	Subsoil of 7509.....	Gray silty loam, 11 to 44 inches.	1.40	.18	.66	.82	11.12	13.44	64.60	9.16
7514	Subsoil of 7513.....	Yellowish-gray loam, 10 to 56 inches.	.99	.30	.70	.50	2.74	15.30	68.66	12.06
7506	Subsoil of 7505.....	Light-gray loam, 9 to 46 inches.	3.41	.40	3.34	2.66	6.88	7.30	58.76	20.66

DRAINAGE.

The Yakima silt loam, situated as it is between hills and receiving all the drainage therefrom, is in some localities thoroughly saturated during the rainy season, water occasionally standing on the surface. This condition can be corrected by drainage, which already takes place in a measure through the natural water courses that traverse the several areas. The channels of these draws are usually 2 or more feet deep, but they are insufficient for thorough drainage on account of the heavy nature of the soil and the uniformly level surface and slight inclination of most of the areas. The natural drainage channels could, perhaps, be made to answer every purpose by the addition of some open ditches. Underdrainage with tile would, however, be the most satisfactory means of removing the excess of water from these wet areas.

The benefits to be derived by thoroughly draining the wet areas of this soil would be quite marked. Lands that are now cold and late and fit only for pasturage or for growing timothy could by this means be made available for the production of all the ordinary crops grown successfully on the surrounding soil—the Yakima fine sandy loam.

AGRICULTURAL METHODS.

Deep, fertile soils and a long, dry summer are the chief factors influencing the agriculture of the Lewiston area. According to the prevailing custom of the area, the fields are all thoroughly plowed, this work being generally done by means of gang plows drawn by four or

six or even eight horses. On the main plateau the uneven surface has brought about a plan of plowing the fields in irregular patches, an effort being made to go around the hills, turning the soil wherever possible downward. This method, while it requires less work and tends to prevent washing, has laid bare the subsoil in the more exposed places. Spots of this character are locally known as "clay points." They give a light yield of grain, which ripens in advance of the rest of the crop. The difference in production is not only due to the lack of fertility, but the soil, being heavy, cracks open and is consequently much less retentive of moisture than the surrounding soil, and the crop is apt to suffer from drought. Orchards and truck gardens require a more thorough tilling of the soil than the grain and are consequently given more attention. The lands are thoroughly plowed during the winter and then given thorough cultivation during the summer, an effort being made to keep the soil free from weeds or grass. Orchard grass or grain between the trees is considered more injurious than beneficial.

Fallowing—that is, plowing lands thoroughly and allowing them to lie idle a year—is a method which, though of comparatively recent introduction, has gained great favor as a means primarily of checking the growth of foul weeds, principally wild oats, cockle, and Chinese lettuce, which get so thick as to greatly reduce the quantity and injure the quality of the grain crops. Late in the spring, when the weeds are well started, the lands are plowed, rolled, and harrowed, and during the summer an effort is made to sprout and kill all the injurious seed in the surface soil. The increase in yield after a year's summer fallowing is also encouraging, so much so that in many cases lands are being fallowed every third and fourth year, and in some cases even every other season, although it is said that fallowing every fifth year is sufficient to keep the weeds in check. Winter wheat is generally planted on the fallowed soil, the ground being too rich for barley or oats, which commonly grow so tall and rank as to lodge. They are sown to greater advantage as a second or third crop.

The following rotation in the grain fields is favored by many: (1) Winter wheat, (2) barley or oats, (3) barley, wheat, or oats cut for hay, (4) fallow; or (1) winter wheat, (2) wheat, (3) barley or oats, (4) fallow. Timothy, clover, and other grass or pasture lands are occasionally rotated with grain and give very encouraging returns. Alfalfa has also been turned under. The results were good, but the practice is as yet too new to say whether the end justifies the means. Flax is introduced into the grain rotation in some places and in a few cases is sown as the principal crop.

Drills are used to seed the grain field, and the crops are harvested with either a binder or a header. The former, notwithstanding the fact that it requires more time and is more expensive to operate, is generally considered the better and more economical in the long run,

as the grain can be harvested and shocked before it is thoroughly ripened, thus insuring it against serious damage by wind or rain. There is also less loss in handling the tied bundles than the loose straw, and a smaller number of heads drop and are lost.

The combined harvester, drawn either by traction engine or by horses, can not be used to advantage on the Genesee and Moscow plateaus, as the hills are too steep. There are, however, sections on the south side of the Clearwater River where traction-engine outfits are used to advantage, and in such places steam plows also facilitate the tilling of the land.

The grain is usually thrashed by an ordinary separator run by steam, though a few horsepower machines are used. The grain is sacked in bags holding a little over 2 bushels, and is then hauled to storage houses or to the nearest railroad siding.

Wheat, barley, oat, and timothy hay are cut with the ordinary mower, the grain hay being cut while the head is yet in the dough. Cut at this stage the straw makes better fodder than when mature. Some grain hay for local consumption is also cut with the binder. The hay when cut is allowed to dry and is then gathered into cocks with horse rakes. After curing it is collected in stacks convenient to the baling places. Considerable hay is baled for shipment.

Where fruit is the money crop the orchards are given much attention, no little care being exercised to keep the trees healthy by proper pruning and spraying. Grapes are also carefully cultivated. They are well pruned each fall and thoroughly dusted with sulphur in the spring to prevent the mildew. All fruits and melons are picked when mature and, after being crated, go to supply the local and near-by markets. Some is shipped into Montana, where fancy prices are obtained. The market for green fruit is very good, and only a very small proportion of the crop is dried.

The rainfall on the upland, excepting the steep canyon walls where most of the rain runs off, is adequate for the production of all the ordinary crops. Irrigation is practiced only along the Clearwater River. The water is either taken from the river by gravity ditches or by pumping, or is obtained from springs that issue from the basalt bluffs. The soils being sandy and free from injurious salts, irrigation is a simple matter, water being applied with impunity. At present there is also considerable land along the river that could be put under water without much outlay and converted into valuable farms suited to the production of all the ordinary crops grown in that vicinity.

The soils in their original state being very fertile, the want of plant food has not as yet been seriously felt. The gradual depletion of the essential elements of plant food by continuous cropping is, however, inevitable, and its progress can be checked only by rotation, fallowing, and fertilization. The diminution in yield is already apparent to the

observer, who also notes the increase in crop following a year's summer fallow. The fallowing, while killing the weeds and conserving the moisture, also gives the soil an opportunity to weather and store up a greater amount of available plant food for the ensuing crop.

Beneficial results were reported from the application of stable manure and lime. The use, however, of either stable manure or commercial fertilizers has not generally been given any serious consideration. A custom of burning the straw stacks and disposing of the manure in any way is prevalent. This condition should be changed. The importance of conserving plant food whenever possible is a matter of grave importance and should demand the serious attention of the farmers even of so naturally fertile a country as that comprised in the Lewiston area.

AGRICULTURAL CONDITIONS.

Soils of remarkable fertility, admirably adapted to the crops which they are called upon to produce, good transportation facilities, and the occupancy of an energetic class who generally own the land they farm have in a comparatively short time converted the rolling, grass-grown prairies of the Lewiston area into prosperous, well-fenced, and often well-improved farms. The area, lying within the southeast corner of the justly famed Palouse wheat district, enjoys part of its enviable reputation for wheat production. This Palouse district produces annually about 50,000,000 bushels of wheat, to which output the Lewiston area contributes materially. The prosperity which the area enjoys can not in every case be measured by the farm buildings. Here and there are large barns and commodious dwellings, but the country is too new for one to expect the most striking evidences of prosperity on every hand. The old, more or less temporary structures are gradually giving way to more stable and commodious buildings, and it is only a question of time when the area will be dotted with comfortable dwellings and ample barns and sheds for the proper housing of stock and other products.

The size of the farms varies from a few acres, as in farms situated along the Clearwater River and in the immediate vicinity of the town, which are irrigated and devoted to horticulture and trucking, to 1,000 acres, as in the wheat farms on the uplands. With the increase in population, however, the large tracts are gradually being subdivided, giving place to smaller farms under more intensive culture. This tendency is viewed with much satisfaction by those most interested in the future of the country. The small farm, highly cultivated, diversified farming, and the adoption of modern methods promise the surest prosperity of a stable agricultural industry. The advantages to be derived by a thickly settled community along social, educational, and other lines are important.

Land values depend on quality, adaptability, and proximity to market and transportation facilities. Wheat land in the Genesee and Moscow plateau is held at from $15 to $65 per acre, the average being probably about $35, while land along the Clearwater River, under irrigation and adapted to horticulture, is held as high as $150 an acre; and when in trees often much higher.

On the greater number of farms the work throughout the year, except during the harvest season, is done by the farmer, with possibly the assistance of one or two outside hands. This number is, however, exceeded on the large estates, where most of the work is done by the hired help. The wages paid run from $15 to $25 per month, with board in addition. During the harvest season the amount of work is greatly increased, extra help is required, and wages go up to $2 or $3 a day with board. The wages depend upon the nature of the work and are quite uniform throughout the grain belt.

Wheat is the principal crop, and to that product is due much of the area's rapid advancement. The other grains—barley, oats, and flax—are also raised in large quantities and form an important part of the farmer's resources. The grasses, though at present occupying a high place among the products of the area, will in the future, with the increase of dairying and stock raising, become even more important. Timothy is grown with great success, principally on the level valleys, and large crops of choice hay are cut and baled annually. The Russian brome grass, a forage plant recently introduced, bids fair to become a very important crop, as it is rapidly gaining favor with the farmers. It is very hardy, makes good pasturage, and when allowed to grow for hay gives large yields of superior quality. Orchard grass, redtop, tall meadow oat grass, alfalfa, rye grass, and meadow fescue also grow well and make good pasturage and hay.

Corn, pumpkins, and other crops sensitive to cold and requiring a long time to mature have been tried by many. The season is, however, too short to allow a perfect development except in a few especially favored locations, and as a result few attempts are made to grow these crops commercially.

Orchards of peaches, apples, plums, cherries, pears—in fact, of all the deciduous fruits—have been set out along the Clearwater River. The trees grow fast, bear well, and produce abundantly. Several small vineyards have made a good showing and are indicative of the results that may be expected from this fruit in the future. Cantaloupes and melons are also deserving of mention. On the upland orcharding is not carried on commercially to the exclusion of other products of the farm. In the vicinity of the ranch houses, in many cases, from 1 to 4 acres are devoted to fruit and berry culture. Apples and cherries do well, but the season is too short for the proper development of most of the other fruits. All varieties of berries,

excepting possibly blackberries, grow fast and give very large yields of superior fruit with comparatively little attention. Small truck gardens in the vicinity of the house furnish the country and some of the city populace with most of the ordinary vegetables during the summer. The deficiency and also the spring and fall demand is filled by the products of land in the vicinity of Lewiston, which, on account of its low lying and sheltered position, is favored with a warmer climate, and is thus able to produce early and late vegetables as well as vegetables which can not be grown successfully on the uplands.

Since the curtailment of the ranges by the taking up and farming of the public land within the area, considerable interest in the raising and feeding of small herds of stock on the home farms has been developed. The returns from raising horses, cattle, sheep, and hogs are encouraging, and no little attention is being paid to the improvement of the breeds. In future the output not only of stock but also of dairy products may be expected to greatly increase. Flocks of poultry also add to the annual income of the farmers.

The roads, which generally follow the valleys or depressions in the Moscow and Genesee Plateau, are, during the winter or rainy season, very muddy and all but impassable, while in the summer they are extremely dusty. In the lowlands, or in the area south of the Clearwater River, the roads, while just as dusty if not dustier in summer, are much better in winter. This difference is due to the difference in rainfall, the sandier character of the soil, and the topography, which allows the roads to be so constructed as to attain better drainage. The great advantages offered by good roads, as well as the disadvantages and menace to a community in poor roads, are too well known for comment. The untoward conditions in the area can, and it is safe to predict will, be remedied. The underlying rock is hard, and when crushed it breaks with a good fracture, furnishing excellent as well as convenient road-building material. This fact is clearly demonstrated wherever the basalt has been used for macadamizing, as in the streets of Moscow and Genesee.

In the northeastern part of the survey there is a forest consisting of spruce, tamarack, and white and yellow pine. All the merchantable lumber has been cut, but cordwood is plentiful, and large quantities are used annually to supply the local fuel demand.

The area is well supplied with building material. Logs are floated down to the mills at Lewiston from the headwaters of the Clearwater River, where forests of choice white pine, spruce, cedar, and other valuable trees exist. Sawlogs are also shipped to Moscow and there cut into dimension lumber. Basalt has been quarried and used to some extent as building stone, principally for foundations. Good bricks are also made from material furnished by the Yakima fine sandy loam.

The domestic water supply of Lewiston is pumped from the Clearwater River, while that of Moscow is obtained from artesian wells. In the country and small towns water is furnished by wells and springs. The wells are not very deep, and occasionally run dry during the summer. A good supply of water may be obtained by drilling wells into the porous material or sedimentary beds lying between the layers of basalt.

The area is well supplied with transportation facilities. Two railways, the Oregon Railway and Navigation Company and the Northern Pacific Railroad, have branch lines entering Moscow, Genesee, Lewiston, and several smaller places. Boats run up the Snake River as far as Lewiston, carrying both freight and passengers. Country mail routes have been surveyed, and a number of the farmers are already enjoying the advantages of rural delivery.

Moscow, situated in the northern part of the area, is the county seat of Latah County. It has a population of about 3,000, and is the home of the State University, which offers many educational advantages. Lewiston, a growing city in the extreme southwestern corner of the area, is the county seat of Nez Perces County, and has a public library and a normal school. Genesee, which is midway between Lewiston and Moscow, is of importance as a wheat-shipping point. It is estimated that the surrounding region ships annually from Genesee approximately 1,500,000 bushels of wheat, the greater part of which comes from within the limits of this survey. As Moscow, Lewiston, and the several freight-receiving stations are also shipping points, the amount mentioned is probably not more than one-third of the wheat produced in the area surveyed. These towns are also important as home markets and as the residence of merchants who buy and handle the country produce.

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.