THE GEOLOGICAL SURVEY OF WYOMING
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REPORT ON THE UNDERGROUND WATER RESOURCES OF THE NIOBRARA RIVER VALLEY, NIOBRARA COUNTY, WYOMING

by

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Introduction.- As a result of the recent drought with its consequent loss of surface water supplies the importance of the underground water has been strongly emphasized. The Geological Survey of Wyoming with the cooperation of the State Planning Board has been engaged in assembling data regarding this increasingly important resource. The following is the second of a series of detailed regional studies of the occurrence of underground water in Wyoming.

The area covered in this report lies in the valley of the Niobrara River and parts of vallies of its tributaries between the state line and the headwaters of the river a short distance west of Manville.

Topography and Drainage.- This region with the exception of the extreme eastern portion and southwestern corner has the rolling topography typical of the Western Great Plains. The Upland is flat or gently rolling and is cut by the wide flat-floored valleys of the Niobrara River and its tributaries. In the southwestern corner of the region the topography is rough and broken where inliers of older rocks rise out of the horizontal Tertiary cover. Several smaller inliers of older rock break the eveness of the otherwise rolling country. One of these inliers occurs on the Niobrara River two miles east of Manville, another at Lusk, and a third three miles north of Lusk.

In the extreme eastern portion of the region rough bad-land topography prevails.

The Niobrara River heads in a wide shallow nearly flat-floored valley in the vicinity of Manville. From a point two miles east of Manville to a point three miles west of Lusk the river is confined to a steep valled valley from one-eighth mile to one-quarter mile in width. From the point three miles west of Lusk to a point three

miles east of Lusk the river valley is from one-half to three-quarters of a mile wide. A tributary, Silver Spring Creek, heads in Sec. 21, T. 31 N., R. 64 W. and flows northeast for a distance of ten miles and enters the main Niobrara River valley in Sec. 27, T. 32 N., R. 63 W. Here it turns southeast and flows parallel to the river for a distance of four miles, joining the river in Sec. 31, T. 32 N., R. 62 W. Through the stretch where Silver Spring Creek parallels the Niobrara River they occupy the same wide flat valley with a low imperceptible divide separating them. The valley in this stretch is from two miles to two and a half miles wide with low relatively steep valley walls. From the junction of the Niobrara River and Silver Spring Creek to a point one and a half miles above the junction with the North Fork of the Niobrara (Duck Creek) the valley is about one mile in width, the valley walls rising 40 to 50 feet above the floor. From the point one and one-half miles above the junction of the Niobrara River and the North Fork to the junction the valley is a half mile to a quarter mile wide. The North Fork of the Niobrara River (locally called Duck Creek) heads in wide shallow swales north and northeast of Lusk. The valley of North Fork from its head to a point six miles above the junction with the Niobrara River is wide and shallow with low gently sloping valley walls. From this point, six miles above the junction with the Niobrara, to the junction the valley varries from a quarter mile to a mile in width and has 30 to 50 foot bluffs forming the valley walls. From the junction of the Niobrara River and the North Fork to the state line the valley is about one mile wide with steep valley walls rising 50 to 100 feet above the river.

The Niobrara River is an ephemeral stream down to a point three miles east of Manville where it has a perennial spring-fed flow for about one mile, the flow disappearing at the end of that distance. From the end of this short perennial stretch to a point south of Node the stream is again ephemeral. From the point south of Node to the state line the stream is perennial but has little flow. The North Fork of the Niobrara is an ephemeral stream down to a point about two and one-half miles above the junction with the Niobrara where it becomes perennial. Silver Spring Creek is ephemeral throughout except for a short stretch near its head.

Geology.- This region contains exposures of Tertiary, Triassic, Pennsylvanian, Mississippian, Cambrian and pre-Cambrian rocks. The rocks older than the Tertiary are not important so far as the underground water resources of this district are concerned and their outcrops on the map and their descriptions are generalized.

The pre-Cambrian consists of granite, schist and gneiss which outcrop in small inliers north of Lusk and at Lusk and in a narrow band running a little west of south through the center of Range 64 West, Townships 31 and 32 North. In addition there are several small inliers a short distance east of the main pre-Cambrian ridge near the Niobrara-Goshen county line.

The Cambrian rocks consist of a thin series of red quartzites overlying the granite at Lusk and along the west side of the granite ridge. The bed is probably a thin remnant of the Deadwood formation. It is included with the Mississippian on the map.

The Mississippian rocks consist of limestones and some sandstone, the outcrops of which parallel the granite. The rocks belong to the Guernsey formation. They outcrop on the west side of the granite ridge in Range 64 West and on the east and southeast portions of the inliers at Lusk and north of Lusk.

The Pennsylvanian rocks, belonging to the Hartville formation, are exposed in a wide belt in the southwestern portion of the area west of the granite and Mississippian outcrops. The formation consists of sandstones with some limestone beds. The formation also outcrops in the southeastern portion of the inlier at Lusk.

The Triassic rocks belong to the Chugwater formation and consist of red shales and red shaly sandstones. The beds outcrop only in a small inlier two miles east of Manville on the Niobrara River.

Most of the area is underlain by the almost horizontal Harrison formation of Miocene age. The formation consists, for the most part, of gray to buff fine-textured loosely consolidated sandstone containing a few beds of tough hard well-cemented sandstone a foot or more in thickness. The Harrison formation was deposited upon an old erosional surface which truncated all the older rocks. The thickness varries from a few feet to 300 feet or more.

Underground Water.- The soft sandstone making up the greater part of the Harrison is capable of containing considerable amounts of water, but is so fine grained that it releases its water too slowly to made good wells. The rock in certain beds, however, is badly fractured and broken. Where these broken beds occur beneath the water table they made good aquifers, the contained water being released readily. The broken, fractured beds are often overlain by the tough well-cemented sandstone beds mentioned above. These beds are tightly cemented and form a good cap-rock to the water-bearing fissured rock. The beds dip slightly to the east and in the central and eastern portion of the region the water in the fissured beds beneath the tight "cap rock" is under pressure, the water level rising in the wells when one of these beds is encountered. In a few cases along the lower portion of the North Fork of the Niobrara flowing wells have been obtained from such beds at depths of fifty feet and ninety feet.

On the valley bottoms throughout the region water in sufficient quantity for stock and domestic purposes can be obtained at relatively shallow depths, the water table being twenty feet or less below the surface. Larger supplies could probably be obtained from one or more of the fissured beds at depths down to 100 to 150 feet, but it is impossible to tell without testing whether or not such beds underly

any specific point. There appears to be, however, numerous beds of this character and it is probable that the entire region is underlain by at least one fissured bed.

On the uplands the water table varies from 40 feet to 170 feet below the surface, and wells yield little more than enough water for stock and domestic purposes. It is probable that fissured beds underlie the uplands as well as the valley bottoms. The greatest recharge to the underground water supplies takes place in the valley bottoms, the slope run-off concentrating the precipitation there. The fissured beds beneath the valleys are consequently saturated while those underlying the upland retain but little water from the rain and snow of the region.

Only a few wells in the area have been tested for capacity consequently little is known about the quantity of underground water available. Two wells a few feet apart located on the valley floor at Manville pump 600 gallons per minute. The wells are 186 feet deep and the water stands at 39 feet. At Lusk, the city well is located on the valley floor near the channel. It is 48 feet deep and the water level varies from 12 to 30 feet. The well developes 300 gallons per minute. A well drilled for Wm. Pfister on the NW cor. NW¼ Sec. 32, T. 32 N., R. 62 W. went to a depth of 299 feet. The water level is 17 feet below the surface. The capacity of the well is about 100 gallons per minute. The well is located on the valley floor several hundred yards from the stream channel. Two wells were drilled by Jim Christian in Sec. 4, T. 31 N., R. 61 W. and in Sec. 32, T. 32 N., R. 62 W. Both wells are on the valley bottom and the water table is only a foot or so below the surface. In the well in Sec. 4 a pit was dug to 16 feet and the water walled off. The well was then drilled to 200 feet. Water was encountered in a fissured bed at 50 feet which flowed over the collar of the pit. A four inch centrifugal pump with a 20 foot suction pipe was set at the bottom of the pit. The pump quickly drew the water down below the end of the suction pipe. The well was deepened and another fissured bed was encountered at 90 feet. A six inch pump was installed and pumped 48 hours at approximately 1000 gallons per minute. The water was drawn below the bottom of the 16 foot pit but did not get out of reach of the 20 foot suction pipe. The well in Sec. 32 encountered the water bearing beds at approximately the same depths and was also carried to 200 feet. Both wells flow at the surface when not being pumped. The capacity of each well is over 1000 gallons per minute.

Conclusions.- The capacity of too few of the wells in the region have been tested to give an adequate basis for a quantitative estimate of the underground water resources. It is believed probable, however, that considerable underground water can be developed for irrigation along the valley bottoms from wells 50 to 100 feet in depth. The large capacity wells in the district have been developed from the fractured and fissured beds of the

Harrison formation. The presence of such beds at any specific point cannot be determined except by drilling and pumping tests.

A large part of the area on the bottom land along the streams supports sub-irrigated alfalfa. Pumping in large quantities from shallow wells in those areas may lower the water table beyond the reach of the roots and so destroy valuable meadow land. It is believed that wells which derive their water from fissured beds overlain by the tight hard sandstone cap-rock should not effect the sub-irrigated lands.

Name	Location	Depth to Water	Depth of Well
Richardson	NW¼ Sec. 24, T. 33 N., R. 65 W.	75	120
Krey	SW¼ Sec. 24, T. 33 N., R. 65 W.	15	19
Krey	NW¼ Sec. 25, T. 33 N., R. 65 W.	30	75
Cantwell	SW¼ Sec. 25, T. 33 N., R. 65 W.	10	40
Bryant	SE¼ NE¼ Sec. 27, T. 33 N., R. 65 W.	50	125
Wilson	NE¼ NE¼ Sec. 2, T. 32 N., R. 65 W.	16	70
Town of Manville		39	186
Water encountered at 80 and 140 feet. 600 gal. per. min.			
Burhoop	SW¼ SW¼ Sec. 13, T. 32 N., R. 65 W.	50	450
Water encountered at 80 feet			
Burhoop	NE¼ NE¼ Sec. 13, T. 32 N., R. 65 W.	50	80
Henrichson	SE¼ Sec. 7, T. 32 N., R. 64 W.	38	53
Water encountered at 53 feet			
Larsen	NE¼ Sec. 18, T. 32 N., R. 64 W.	60	85
Irvine	NW¼ NW¼ Sec. 10, T. 32 N., R. 64 W.	35	45
Thon	NW¼ NE¼ Sec. 15, T. 32 N., R. 64 W.	12	90
Thon	SE¼ NE¼ Sec. 15, T. 32 N., R. 64 W	little water	108
Bradley	SE¼ Sec. 1, T. 32 N., R. 64 W.	20	58
Barker	SW¼ Sec. 7, T. 32 N., R. 63 W.	240	270
C. & NW. RR. well at Lusk		20	58
Well 18 feet in diameter			
Lusk town well		12-30	48
Well 12 feet in diameter. 300 Gal. per. min.			
Reed	SE¼ Sec. 18, T. 32 N., R. 63 W.	10	75
Reed	NE¼ Sec. 17, T. 32 N., R. 63 W.	40	--
Cornet	NE¼ Sec. 15, T. 32 N., R. 63 W.	20	42
Hunter	SW¼ Sec. 27, T. 32 N., R. 63 W.	10	61
Sturman	NW¼ Sec. 12, T. 32 N., R. 63 W.	65	100
Sturman	SE¼ SE¼ Sec. 14, T. 32 N., R. 63 W.	20	75
Sturman	NW¼ SW¼ Sec. 13, T. 32 N., R. 63 W.	20	90
Sturman	SW¼ SW¼ Sec. 13, T. 32 N., R. 63 W.	20	75
Hunter	SW¼ SE¼ Sec. 26, T. 32 N., R. 63 W.	25	65
Hunter	SE¼ Sec. 35, T. 32 N., R. 63 W.	100	
Anderson	NW¼ NE¼ Sec. 19, T. 32 N., R. 62 W.	40	70

Name	Location	Depth to Water	Depth of Well
Bump	SE¼NE¼ Sec. 19, T. 32 N., R. 62 W.	70	110
Bump	SW¼NE¼ Sec. 19, T. 32 N., R. 62 W.	20	60
Larsen	SW¼ Sec. 17, T. 32 N., R. 62 W.	18	-
Todd	NE¼SE¼ Sec. 20, T. 32 N., R. 62 W.	20	90
Sabin	NE¼SE¼ Sec. 29, T. 32 N., R. 62 W.	18	-
Sabin	SE¼SE¼ Sec. 29, T. 32 N., R. 62 W.	60	-
Sabin	SE¼SE¼ Sec. 29, T. 32 N., R. 62 W.	50	80
Pfister	NW Cor. Sec. 32, T. 32 N., R. 62 W.	17	299
100 gallons per minute			
Pfister	Center Sec. 5, T. 31 N., R. 62 W.	50	60
Bruch Cattle Co	NW¼ Sec. 4, T. 32 N., R. 62 W.	68	118
Beyers	SW¼ Sec. 29, T. 31 N., R. 62 W.	119	130
Larsen	SW¼ Sec. 16, T. 32 N., T. 62 W.	4	-
--------	SE¼NE¼ Sec. 28, T. 32 N., R. 62 W.	72	100
Bell	NE¼ NE¼ Sec. 4, T. 31 N., R. 62 W.	5	42
Bell	SE¼NE¼ Sec. 4, T. 31 N., R. 62 W.	41	101
Pfister	Center W-line Sec. 16, T. 31 N., R. 62 W.	30	-
Water encountered at 40 feet			
Jordan	SE¼ Sec. 22, T. 32 N., R. 62 W.	12	
Jordan	NW¼ Sec. 27, T. 32 N., R. 62 W.	60	
Node, Wyoming	Water encountered at 76 feet	72	100
¼ mi. SE of Node		40	100
Jordan	NE¼ Sec. 26, T. 32 N., R. 62 W.	8	50
Water encountered at 17 feet			
Jordan	NE¼NE¼ Sec. 36, T. 32 N., R. 62 W.	flowing	38
Water encountered at 38 feet			
Jordan	NE¼NE¼ Sec. 36, T. 32 N., R. 63 W.	100	-
Boyles	E½ Sec. 19, T. 31 N., R. 61 W.	120	140
Christian	NW¼ Sec. 32, T. 32 N., R. 61 W.	flowing	200
Water encountered at 50 and 90 feet, 1000 gal. per min.			
Christian	NE¼ Sec. 32, T. 32 N., R. 61 W.	40	80
Christian	NW¼ Sec. 33, T. 32 N., R. 61 W.	170	200
Christian	NW¼NE¼ Sec. 4, T. 31 N., R. 61 W.	flowing	2000
Water encountered at 50 and 90 feet, 1000 gal. per min.			
Dean	SW¼ Sec. 4, T. 31 N., R. 61 W.	5	18
C. & NW. RR. well at Van Tassell		40	70

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MAP SHOWING GEOLOGY AND THE POSITION OF THE WATER TABLE IN THE NIOBRARA RIVER VALLEY, NIOBRARA COUNTY, WYOMING

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