REPORT ON

WATER RESOURCES OF THE REUBENS-MELROSE AREA

NEZ PERCE COUNTY, IDAHO

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By

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Introduction

The Reubens-Melrose area of Nez Perce County lies south of the Clearwater River and is bounded on the east by Big Canyon Creek, on the south by the Nez Perce-Lewis County boundary, and on the west by Cottonwood Creek.

It is roughly 200 square miles in area and is an area of topographic and geologic complexity. Consequently a variety of ground water conditions exist. Due to its complex nature and to the fact that reliable information as regards the nature and history of wells is very difficult to obtain, accurate determination of ground water conditions is very difficult.

The interpretations and recommendations given in this report are of necessity generalized for the above reasons.

Physical Features

Topographically, the area is a dissected plateau that dips gently northward. Viewed in a broad way the drainage pattern is extremely youthful since the numerous canyons are deep and steep sided, but in detail, on the plateau surface the drainage pattern is mature and topography is rolling or undulating. Total relief is about 2500 feet, elevations varying from slightly under a thousand feet at the Clearwater River to nearly 3700 feet at the south border of the area. The general, slight, northward slope of the plateau surface is broken in the vicinity of ~~outlook~~ Lookout (Sec. 2, T 35 N, R 2 W) by a conspicuous escarpment trending NE-SW and varying in height from only 50 feet at its northeast end in Sec. 35 to about 500 feet at its opposite end 5 miles southwest where it merges into the upper canyon of Cottonwood Creek.

Further in exception to the general monotony of the plateau surface is a steep westward slope of the area north of the aforementioned escarpment and west of Gifford and Summit. This area is "broken" and irregular in contour and lacks an erosional escarpment adjacent to Cottonwood Creek.

Geology

The predominant rock in the area is basalt occurring in many flows of great areal extent. A total of over 2000 feet of stratigraphic thickness are exposed in the area. Interstratified with the basalt are two or more layers of sandstone and shale. Since these rocks are softer and consequently less resistant to erosion than the basalt, they are not well exposed except locally. The topmost sedimentary layer occurs about 700 feet stratigraphically below the top of the basalt series and is a hundred or more feet thick. Another, of probably greater thickness occurs nearly 2000 feet down in the basalt series. Doubtless other layers of sediment and soil occur between the lava flows for there is abundant evidence that commonly long-time intervals existed between the volcanic eruptions that gave rise to the lava flows. This lava series is without question part of the Columbia River basalts that cover nearly a quarter million square miles in Washington, Oregon and Idaho.

The series as a whole is slightly inclined to the north, any given layer or horizon being parallel to the plateau surface and the incised edges of the hardest layers are well exposed in all the canyon walls. There is an exceptional situation at the northwest edge of the area, in the Clearwater Canyon. Here the basalt and sediment layers dip to the south forming a structural trough parallel to and a mile or so south of the river. On the north bank of the river they dip north, thus the river follows the crest of an upwarp or anticline for several miles in this vicinity.

A second exceptional area, from a structural standpoint, is the aforementioned "broken" area lying north of the ~~outlook~~ Lookout escarpment. The escarpment itself is the surface expression of a fault, the area to the north being depressed or slumped a vertical distance roughly equal to the height of the escarpment. It is evident that this fault (see structure section and map) determines the position of Cottonwood Creek. The faulting did not occur along a single plane but rather the displacement took place in a zone perhaps a quarter mile in width and the whole downfaulted segment is broken and distorted.

Underlying the basalt and sediments is a series of ancient crystalline and metamorphic rocks: gneissoid granitics, schist and greenstone principally. They are herein referred to as the "complex". They form the ancient terrane upon which the lavas were outpoured. Within the area the highest known elevation of the contact between the basalt and the "complex" is 2380 feet, just west of the town of Peck. Five hundred feet of lava overlie the complex here. The lowest elevation of the contact is $3\frac{1}{2}$ miles east of Lenore where it dips under the land surface and is 1060 feet above tide. The old terrane then had a minimum total relief of over 1300 feet in the area and probably much more than this. The base of the basalt must consequently be extremely irregular.

Overlying the basalt is a layer of silty and sandy sediment commonly regarded as being of loessial origin. The presence of some gravel in these sediments indicates that they are at least in part fluvial in origin. The thickness of the sedimentary layer is variable since the plateau drainage pattern has entrenched itself in them but is probably nowhere more than 50 to 75 feet. Weathering and soil forming processes have in places produced a water tight clayey horizon in the soil profile.

Water Resources

Household and stock water supplies are derived from springs, stock ponds and both shallow, dug and deep drilled wells. None of these has proved entirely satisfactory.

All reliable perennial springs are situated deep down in the canyons. Usually several hundred feet below the plateau level. Others at sufficiently high elevation to be of use are seasonal in character and are of what may be called the soil moisture type.

Stock ponds silt up in time, and they freeze to great depth in winter and the water generally is unfit for household use. Shallow wells have slow recharge rates because of the general impermeability of the sediments in which they are dug. Deep wells are uncertain and are expensive because of the great depth to which it is necessary to drill. In the basalt, ground water conditions are extremely uncertain. The formation cannot be visualized as having a single definite water table for the layers vary in permeability between wide extremes. Water movement downward is thus impeded and this feature of the series provides uncertain, perched water supplies. These would not likely occur adjacent to a canyon for there ground water escapes in springs.

The area is not easily classifiable into ground water provinces for with one or two exceptions changes are gradational. For instance, ground water is reasonably near the surface at the south boundary of the area,

while at Reubens (elevation 3675 feet) two wells 440 feet and 800 feet deep in basalt apparently have unlimited supplies of water, providing all needs of the community, the railroad and several ranchers in the vicinity. These wells were probably drilled to unnecessary depth and have water at more than one horizon. In this vicinity perched conditions do not exist as there is abundant recharge from the higher country to the south, in which direction conditions are even better. At Winchester (elevation 3900 feet), about 6 miles southwest of Reubens, water standing at 120 foot depth in a 427 foot well provides all the water for the community. The aquifer here is probably the contact between the basalt and underlying granitic rock. Northward from the south boundary conditions become increasingly uncertain as the canyons of Big Canyon Creek, Jack's Creek and Cottonwood Creek and the Clearwater River are approached.

The only recommendation that can be made as to the best location for a drilled well is that it be as far from the edges of a canyon -- say on the midway line of a ridge between the edges of two canyons, and as far south of the Clearwater River as possible. The most dependable aquifer would be the sandstone layer lying 700 feet below the topmost basalt. Thus one "favorable" belt from one to two miles in width, extends roughly northeast from the vicinity of Reubens to Melrose, thence north along the divide between Jack's Creek and Big Canyon Creek to a point about three miles southwest of Peck. It is felt that any well in this indefinitely bounded area, if 700 feet deep, should be successful.

In the vicinity of Reubens recharge of the underground is in large part from the south and in addition there is some local recharge by downward seepage of soil moisture. Consequently it is the most favorable vicinity in the area and water may be found in any porous layer, as for instance, the contact between two basalt flows. North of Melrose and Lookout, however, recharge from the south is prevented by canyons tributary to Big Canyon Creek, Jack's Creek and Cottonwood Creek, and by the lookout fault escarpment, which must be regarded as being almost, if not quite, as effective a source of ground water drainage as any of the major canyons. The only source of recharge then is local deep seepage. The reason such a large area west of Gifford and Summit is regarded as favorable is that it lies at relatively low elevation and that local deep seepage is great because of the "broken" nature of the country. In that area mapped II it is felt that it may be necessary to drill 700 feet for water. In areas I and III abundant recharge or low elevations provide a more favorable condition. It is thought, but it cannot be said with certainty, that water would be found at 400 feet. In all other parts of the area ground water conditions are so extremely uncertain that little or nothing can be concluded. For instance, in the zone between the lookout escarpment and the south boundary of area III, there is the uncertainty as to how effective the fault is as a drainage medium. One should not be misled by the existence of springs in the zone for they are probably supplied by ground water moving in from the south or they are due to local conditions in the "broken" basalt-sediment mass. In the rest of the area, existing successful wells should be regarded as accidental.

Development of Deep Ground Water

An important consideration in drilling in the area is the nature of the water supplies that may be encountered. In area I more than one aquifer may be encountered and drilling may be continued until a sufficient number have been penetrated to provide the desired amount of water. There need be little fear of "losing" the first water supply penetrated.

In area II the reverse is true. There would be considerable hazard involved in drilling past the first water since perched conditions likely prevail and the first found water might be lost when drilling encounters the next porous layer. Hence every effort should be made to develop every "show" of water. In hard rock, "shooting" often will open up tight seams and improve their discharge. This should not be resorted to in clay or other soft material since the tendency then is for shooting to plug up the seams. In drilling it is always desirable to keep a careful log, not only of materials encountered but even of as great importance, the level at which water stands in the hole at all times, particularly when a formation change occurs. Water level should be measured every morning before drilling is commenced.

Development of Shallow Water

The shallow water supply has its source entirely in precipitation, is confined to the soil and sediments overlying the basalt and discharges horizontally into high altitude springs, and vertically into the basalt.

Many springs are seasonal and many others are apparently perennial but are influenced markedly by climatic changes. One or more wet years may cause an almost immediate discharge increase in formerly poor springs, or conversely, one or more dry years may cause a diminishing, or cessation of flow of a formerly good spring.

These intermittent and apparently permanent springs are not confined to any altitude range but probably could be distinguished from true water table springs by noting their discharge rates over a period of years. Water table springs should show only minor fluctuation over long periods of years and they probably will be seen to issue from fissures in hard rock in the bottoms of the canyons several hundred feet below plateau level. The intermittent springs are associated with thick soils, particularly on sheltered, densely vegetated, slopes. Development of such springs is risky. Their observable rate of discharge is probably the maximum for their observable periods of discharge since their total discharge is determined by the total local moisture accumulation from the preceding wet season. Excavation to increase discharge rate will therefore probably result in a shorter discharge period. Many springs of uncertain character will be found. In their case the most reliable criterion is their discharge records. Attempts to rejuvenate formerly good springs are rarely successful.

Another possible means of developing additional shallow water exists in shallow wells in the bottoms of the shallow, wide drainageways on the plateau top, particularly in area I and locally in area II. Within these long, wide, shallow headwater drainages groundwater is generally near the surface, but lies within the tight sediment on top of the basalt. The limiting factor in the yield of existing shallow wells is infiltration rate into the well. Logically, by enlarging the infiltration area yield will be increased. Advantage should also be taken of the fact that groundwater movement is down valley, hence an excavation transverse to the valley axis; in other words a cross valley trench would intercept the most water. Such a trench need not be left open but could be backfilled with clean gravel, covered with earth and connecting with a central sump in which would be installed a pump. Tile could be used to facilitate discharge into the sump but it should be used in connection with gravel -- laid in gravel -- since backfilling over the tile with the local heavy soil and sediment would likely render it ineffective.

Water reclaimed in this way may prove unsuitable for household use, particularly if the watershed above is not protected, but it would be suitable for livestock and thus in many cases would alleviate a general farmstead water shortage.

Since stock ponds have proved successful in the area they should be maintained, and additional ponds could advantageously be built. Since one of the drawbacks to their use is freezing to considerable depth at a time when they are not filled to capacity, two suggestions are here made that would render the practice more efficient. First, ponds should be constructed in a series of two or more in a given drainage way and facilities for draining the upper ponds provided so that the lower pond could be filled to capacity at the beginning of the freeze. This practice could be carried a step further; that would be to keep the lower pond or ponds filled to capacity by completely draining the upper pond or ponds as quickly as possible and thereby reducing evaporation and seepage area and loss.

Second, tanks or troughs should be installed below the lower pond and facilities provided that would permit drawing of water from under the ice. Ponds should be fenced for they require less maintenance if livestock is not allowed to trample in them.

In conclusion it must be said that it would be more feasible to attempt development of shallow and surface water than to attempt additional deep wells, except in area I. Advice should be given the ranchers as to methods of construction and design of ponds, wells and pumping installations. These types of facilities are entirely within the means of individual farmers both from the standpoints of finances and equipment necessary for construction.

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