# WATER SUPPLY FOR
# OREGON CAVES NATIONAL MONUMENT
# SOUTHWESTERN OREGON

Prepared
in cooperation with
National Park Service

OPEN-FILE REPORT

U. S. Department of the Interior
Geological Survey
Water Resources Division
Portland, Oregon
1967

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

# WATER SUPPLY FOR OREGON CAVES NATIONAL MONUMENT,

# SOUTHWESTERN OREGON

--

By E. A. Oster and E. R. Hampton

--

Prepared in cooperation with the National Park Service

Open-file report

Portland, Oregon

April 1967

## CONTENTS



## ILLUSTRATIONS



## TABLES

# WATER SUPPLY FOR OREGON CAVES NATIONAL MONUMENT,

# SOUTHWESTERN OREGON

--

By E. A. Oster and E. R. Hampton

--

## INTRODUCTION

### Purpose and Scope

In May 1966 the National Park Service requested the Geological Survey to investigate the water resources of Oregon Caves National Monument and adjacent national forest land. Emphasis was to be on possible well sites and the dependable flow of springs and streams near the residence area. The Park Service needs this information to plan for future development. Accordingly, on May 24, 1966, R. B. Sanderson, E. R. Hampton, and L. L. Hubbard of the Geological Survey visited the monument to meet park personnel. The conference was followed by a reconnaissance of streams and springs and of the geology of the area.

This report presents quantitative information on the availability and chemical quality of present and potential sources of water supply for the area. The report was prepared by the Water Resources Division of the Geological Survey, under the direction of Stanley F. Kapustka, district chief.

### Location and Climate

Oregon Caves National Monument is in Josephine County in southwestern Oregon, 24 air miles south of Grants Pass and 20 miles by highway east-southeast of Cave Junction. The monument covers about 450 acres in the Siskiyou Mountains, on a tributary to Sucker Creek, which is tributary to the northwestward-flowing Illinois River. The area is mountainous and heavily timbered. The cave entrance and chalet are at 4,100 feet elevation and the eastern boundary of the monument, about three-fourths of a mile away, is at 5,400 feet elevation.

The average annual precipitation, determined from the isohyetal map published by the Weather Bureau, is about 60 inches. Seventy-five to 80 percent of the precipitation occurs during the period from mid-October to mid-May. As much as 62 inches of snow has been recorded at the Althouse snow course, 10 miles southwest of the monument, in sec. 17, T. 41 S., R. 7 W., at 4,530 feet elevation. Peak runoff usually occurs during the winter as a result of heavy rains and accompanying snowmelt. Streams recede to minimum flow during late summer and early fall; flows increase again after the beginning of the fall rains.

## Geologic Setting

Oregon Caves National Monument is in an area underlain principally by metamorphosed volcanic and interbedded sedimentary rocks and granitic intrusive rocks (Wells and others, 1940). The cave occurs in a southeastward-dipping 400-foot-thick marble pod which is underlain and overlain by metavolcanic rocks. Percolating ground water formed the cave by dissolving the calcium carbonate of the marble. The main cave entrance lies near the base of the marble pod. Examination of the cave and the surface of the marble reveals that the marble is honeycombed with connected and nonconnected solution cavities from the base of the outcrop to near the surface. The shape of the outcrop area and the altitude of the pod suggest that the marble probably does not extend any great distance southeastward beneath the overlying metavolcanic rock.

All rock materials in the area, with the exception of the honeycombed marble, are poorly permeable. Because they absorb little of the annual precipitation, they probably would not yield adequate quantities of water to wells. The honeycombed marble absorbs much of the precipitation that falls on it. This water reappears as major springs, whose flow is the principal source of summer flow in Panther and Cave Creeks, and in River Styx, which issues from the cave mouth.

# WATER AVAILABLE FOR USE IN OREGON CAVES NATIONAL MONUMENT

## Existing Supply

The present water supply for the monument facilities is obtained from Lake Creek, about 1 mile east-northeast of the headquarters (fig. 1). Water from this creek is directed into a head box (fig. 2) in NE¼SE¼ sec. 10, T. 40 S., R. 6 W., and conducted through a 3-inch steel pipeline for 1½ miles to chlorination and storage facilities east of the chalet and headquarters building at 4,160 feet elevation. Park Service personnel report that during most of the year the water delivered to the chlorination facility (40 gallons per minute) is adequate to meet present needs, although breaks in the pipeline,

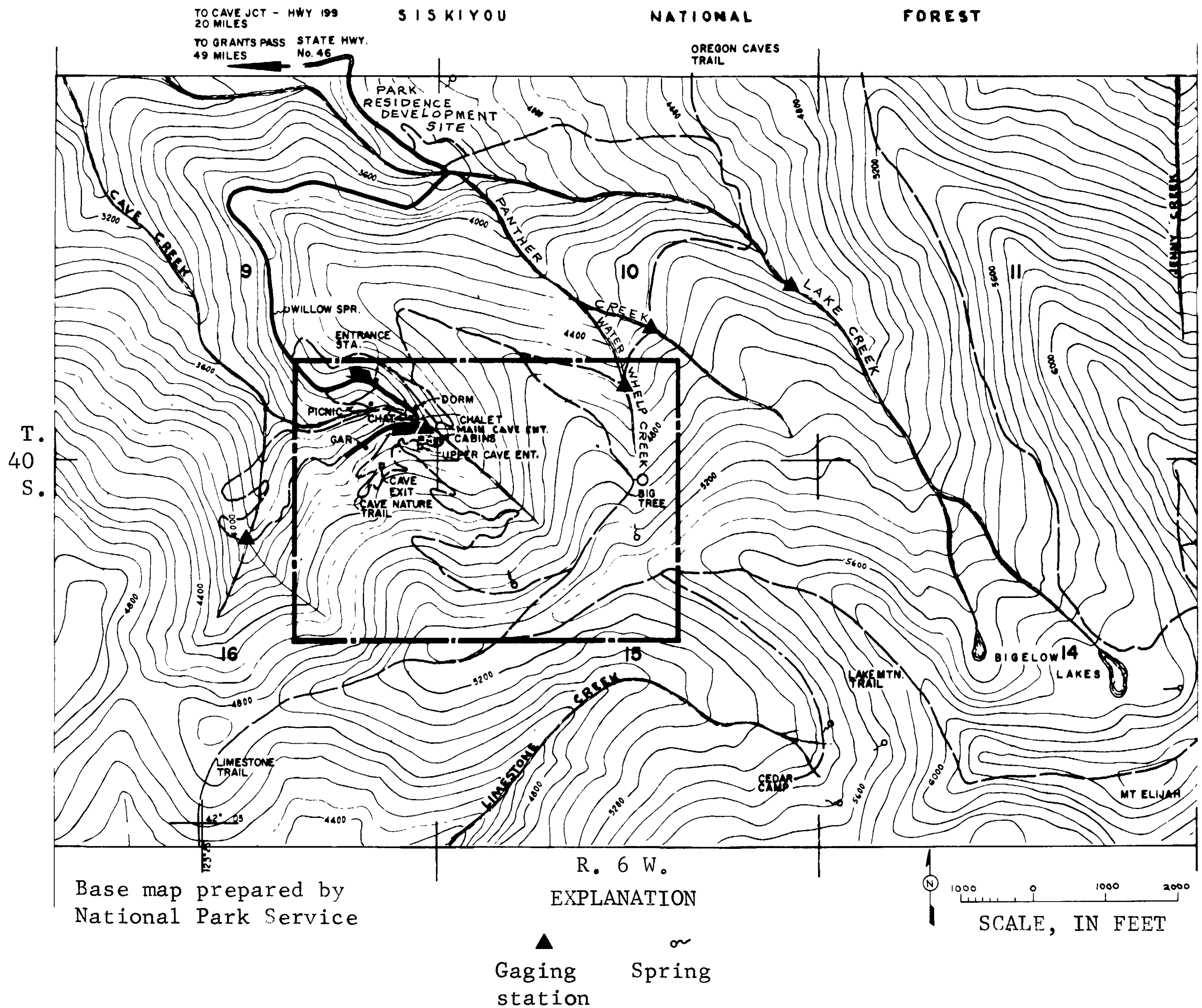


Figure 1.--Oregon Caves National Monument and surrounding area.

Figure 2.--Present intake structure on Lake Creek.

clogged screens, and defective treatment equipment have at times caused water shortages.

The new residence facilities for Park Service personnel, in NE¼NE¼ sec. 9, T. 40 S., R. 6 W., about 1 mile north of the monument headquarters, obtain an inadequate domestic-water supply from a spring in NW¼NW¼ sec. 10, T. 40 S., R. 6 W.

## Potential Supply

Streams, springs, and ground-water conditions in and near the Oregon Caves National Monument were investigated to determine potential sources of water supply for the monument. The results of those investigations, including supporting data, are discussed in the following sections on ground water and surface water. In this report, spring discharge is treated as surface water.

### Ground Water

Because of the steep terrain and the low permeabilities of the rocks, wells in the area are not likely to supply much ground water. The most favorable well site in the area is on an inaccessible steep canyon slope about a quarter of a mile southeast of the chalet and about 400 feet above the mouth of the cave. A well at that site might be drilled into water-filled fractures and voids in the honeycombed marble. A well at least 500 feet deep would be necessary, and the water level in such a well likely would be 300-400 feet below land surface.

A well at the site of the new residence in NE¼NE¼ sec. 9, T. 40 S., R. 6 W. (fig. 1) probably would not supply enough water for the residence because the rocks in that area are nearly impermeable.

In summary, if a large water-filled cavity in the marble were penetrated by a well, an adequate supply of good-quality water could be obtained. However, the drilling of wells to obtain adequate volumes of water in the monument area would be costly and might be unrewarding.

### Surface Water

Five streams that were flowing in and near the monument in May 1966 were selected for measurement throughout the summer of 1966. The results of those measurements are listed in table 1. Because that summer was one of the driest in many years, the low flows measured late in the season probably represent minimum or dependable flows that can be expected in the future. This assumption may be tested for any stream for which short-term or miscellaneous flow records are available by correlation of its flow records with those of a nearby stream for which long-term flow records are available.

Table 1.--Discharge at selected sites

| | Discharge, in cfs[1] | | | | | | Discharge, in gpm[2] | |
|---|---|---|---|---|---|---|---|---|
| Date | Lake Creek | Panther Creek | Water Whelp Creek | River Styx | Cave Creek | Sucker Creek[3] | Unnamed spring[4] | Unnamed spring[5] |
| 1966 | | | | | | | | |
| May 24 | 20.4 | 0.32 | 0.43 | 1.34 | 0.87 | 342 | - | [6]1-2 |
| June 29 | 3.42 | .09 | 0 | .61 | .36 | 110 | - | - |
| July 25 | 1.47 | .06 | 0 | .40 | .35 | 62 | - | - |
| September 1 | .57 | .04 | 0 | .21 | .21 | 38 | 2.4 | - |
| September 27 | .58 | .04 | 0 | .22 | .22 | 33 | - | - |
| October 25 | .96 | .04 | 0 | .20 | .18 | - | - | - |

1/ Cubic feet per second.

2/ Gallons per minute.

3/ Below Little Grayback Creek.

4/ Spring used for Park Ranger's residence supply (NW¼NW¼ sec. 10, T. 40 S., R. 6 W.).

5/ Spring on Cave Nature Trail, elevation 4,960 feet (SW¼NW¼ sec. 15, T. 40 S., R. 6 W.).

6/ Estimated.

Note: 1 cfs=449 gpm.

Correlation and dependable flow.--Sucker Creek, to which all streams in the monument are tributary, has been gaged since 1940 at sites about 5 miles northwest of the northern monument boundary. Streamflow records of Sucker Creek from April to August 1940 and from September 1941 to December 1964 were collected at a site in NE¼ sec. 25, T. 39 S., R. 7 W. The gage was destroyed by the flood of December 1964 and was rebuilt six-tenths of a mile downstream at a site below Little Grayback Creek, in SW¼ sec. 24, T. 39 S., R. 7 W. The drainage area above the new site is 83.9 square miles, 7.7 square miles greater than the drainage area above the old site.

The minimum observed flow of Sucker Creek at the site in section 25 was 17 cfs (cubic feet per second) from September 29 to October 3, 1941. The measurements of flow used in this study were correlated with the site below Little Grayback Creek in section 24. The dependable flow of Sucker Creek below Little Grayback Creek was determined by correlation to be 19 cfs. This figure was obtained by adjusting the observed minimum flow of 17 cfs by the ratio of the drainage areas at the two sites.

Water use can be expected to be greatest during late summer and early fall, when minimum streamflow occurs. The minimum flow observed during the period of record was arbitrarily chosen as the dependable flow of Sucker Creek. Correlation techniques were used to determine the dependable flow of streams measured during this investigation.

The correlation of measurements of flow in Lake, Panther, and Cave Creeks, and River Styx with the concurrent flow of Sucker Creek is shown on figure 3, which also gives estimates of dependable flow of these streams. The recessions of Sucker Creek and the streams investigated during the summer of 1966 are shown on figure 4.

Lake Creek.--Lake Creek is the largest source of supply, with a dependable flow of 112 gpm (gallons per minute) at the present diversion structure. The flow, which is regulated to some extent by natural storage in Bigelow Lakes, is diverted at 4,500 feet elevation and piped by gravity to the chlorination and storage facilities.

Panther Creek.--Panther Creek at the trail crossing at 4,500 feet elevation (fig. 5) has a dependable flow of only 10 gpm. The summer flow of Panther Creek is ground-water discharge from the marble of the cave area. This water was not analyzed for chemical nor bacterial quality.

Water Whelp Creek.--Water Whelp Creek at the trail crossing at 4,500 feet elevation was dry throughout the summer.

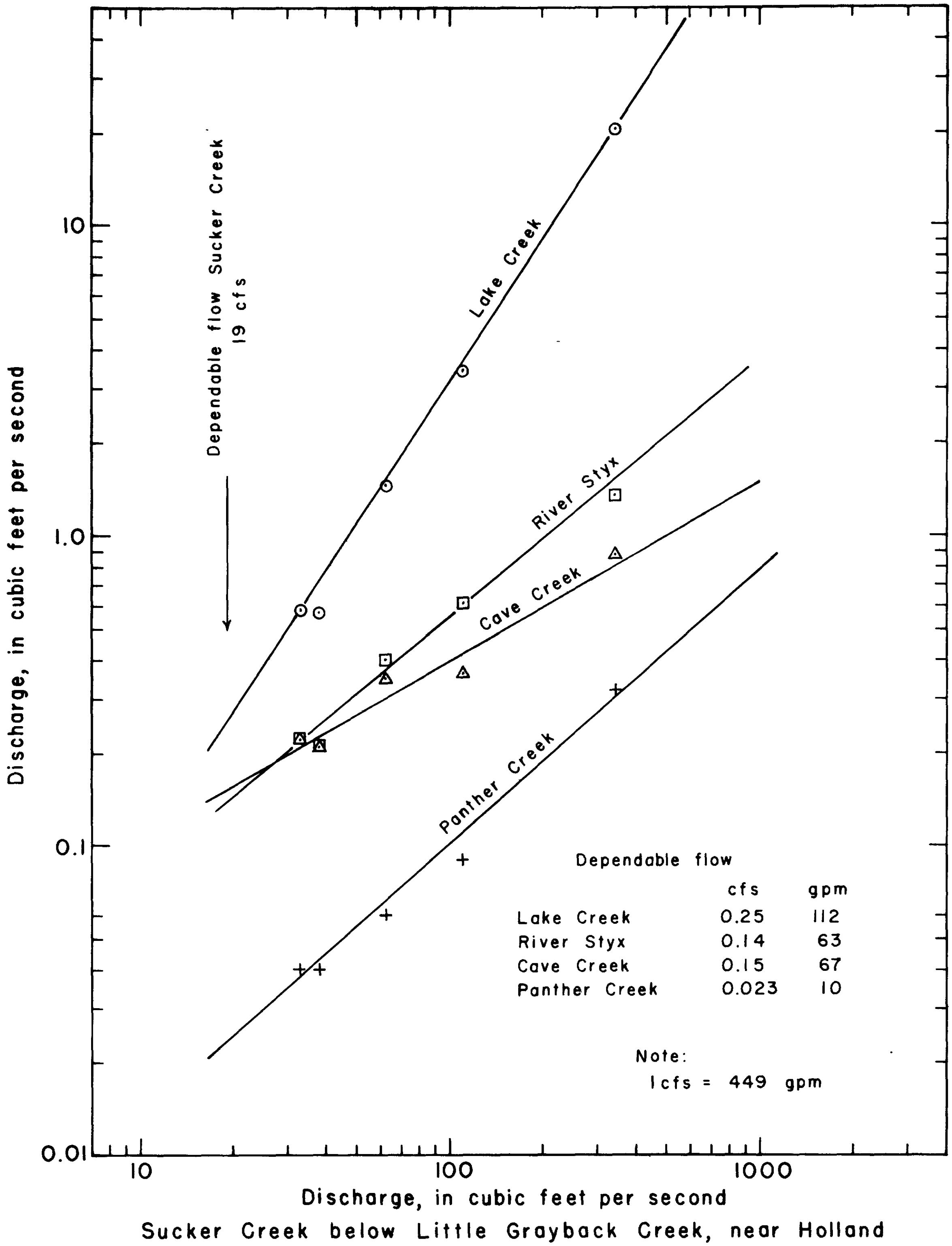


Figure 3.--Correlations of streamflow with Sucker Creek.

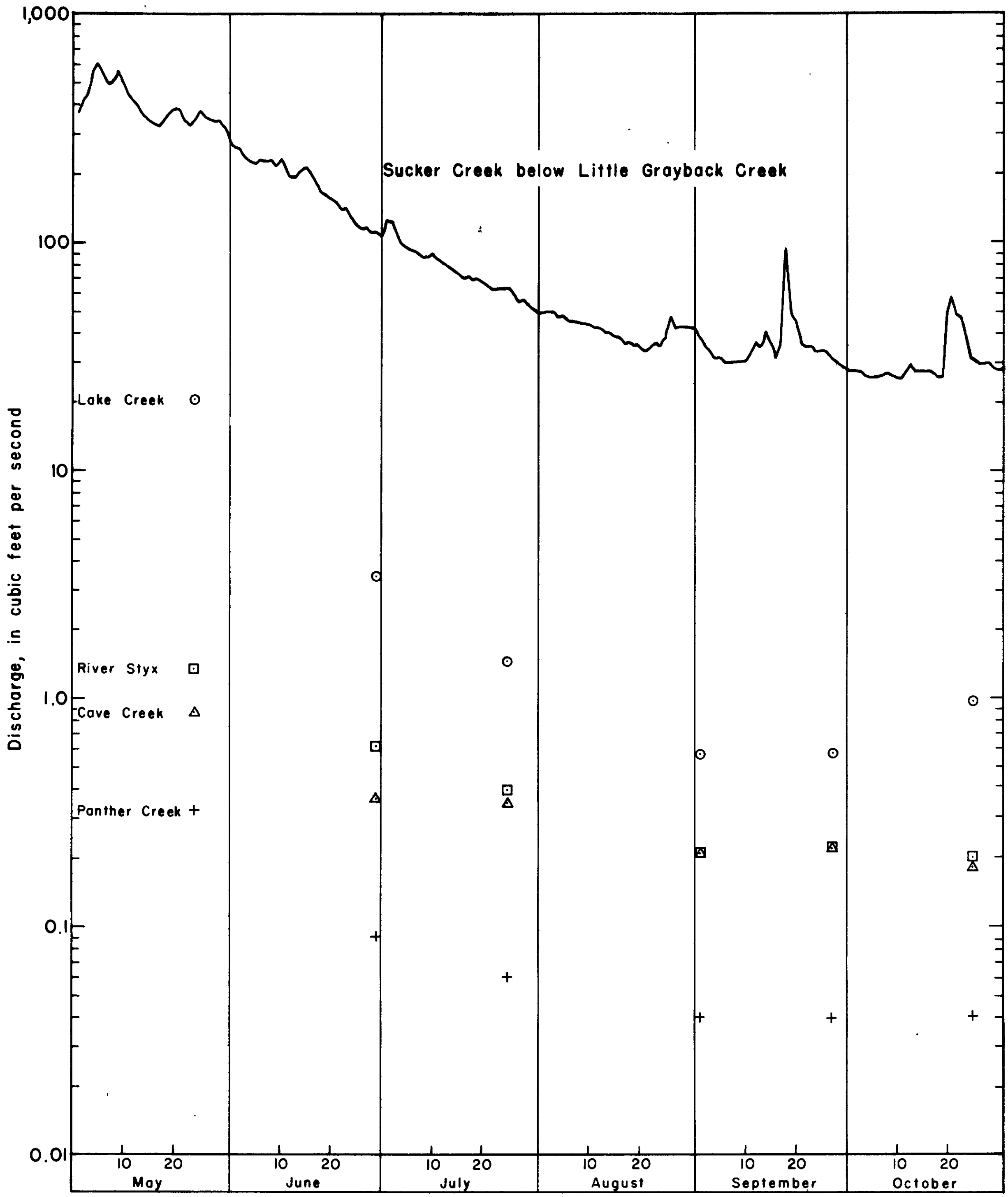


Figure 4.--Summer recessions of Sucker Creek and streams investigated.

Figure 5.--Panther Creek at trail crossing.

River Styx.--River Styx, which has a dependable flow of 63 gpm, heads in the cave, where it is fed by seepage from perched ground-water bodies in the marble and overlying rocks; therefore, it does not respond immediately to precipitation. If water from this stream were to be used, it would have to be pumped to the storage tanks.

Cave Creek.--Cave Creek at the trail crossing at 3,950 feet elevation has a dependable flow of 67 gpm, largely from springs issuing from the marble. Diversion of this stream at the gaging site would necessitate pumping to the storage tanks. However, diversion probably could be made at an elevation of about 4,400 feet, where the flow is somewhat less than at the gage site.

Springs.--The largest springs in the area drain from the marble and sustain the summer flows of Panther and Cave Creeks and River Styx. The spring (discharge estimated 2 gpm May 25, 1966) in SW¼NW¼ sec. 15, T. 40 S., R. 6 W. (elev 4,960 ft), on the Cave Nature Trail (fig. 6), and the spring (discharge 2.4 gpm September 1, 1966) in NW¼NW¼ sec. 10, T. 40 S., R. 6 W., that supplies the Park Service ranger's residence are typical of springs issuing from metavolcanic and granitic rocks.

Chemical and bacteriological quality of water.--Samples of water from Lake and Cave Creeks and River Styx were collected on July 25, 1966 (a time of moderate to low flow), and analyzed for dissolved-mineral content. A sample of water from the spring at the Park Ranger's residence was collected September 1, 1966, and similarly analyzed. The results of the analyses are shown on table 2.

All waters sampled were of the dilute calcium bicarbonate type and of generally excellent chemical quality. The principal dissolved constituents were calcium and bicarbonate. Hardness ranged from 20 to 104 ppm and averaged 78 ppm. River Styx and Cave Creek waters were nearly identical in chemical character, with 35 and 32 ppm of calcium and 130 and 126 ppm of bicarbonate, respectively. These waters contained about five times more dissolved solids than Lake Creek, which contained 5.6 ppm of calcium and 30 ppm of bicarbonate.

To determine the bacterial acceptability of Lake and Cave Creeks, River Styx, and the spring at the Park Ranger residence, samples were collected September 1, 1966, and analyzed by the Oregon State Board of Health Laboratory in Portland, Oreg. All samples except that from River Styx, which was acceptable, contained concentrations of coliform bacteria in excess of the allowable limits set by the Public Health Service Drinking Water Standards (1962, p. 5) for water systems serving less than a thousand people. Consequently, waters from all sources except River Styx require treatment for bacterial contamination prior to use for public supply.

Figure 6.--Spring on Cave Nature Trail.

Table 2.--Chemical analyses of water

[Constituents expressed in parts per million. All samples collected and analyzed by the U.S. Geological Survey]

| | Lake Creek | River Styx | Cave Creek | Spring 1/ |
|---|---|---|---|---|
| Date sampled | 7-25-66 | 7-25-66 | 7-25-66 | 9-1-66 |
| Silica ($SiO_2$) | 12 | 17 | 17 | 19 |
| Iron (Fe) | .03 | .01 | .02 | .06 |
| Calcium (Ca) | 5.6 | 35 | 32 | 16 |
| Magnesium (Mg) | 1.4 | 3.8 | 4.7 | 12 |
| Sodium (Na) | 2.0 | 2.5 | 3.0 | 2.8 |
| Potassium (K) | .3 | .9 | .7 | 1.2 |
| Bicarbonate ($HCO_3$) | 30 | 130 | 126 | 116 |
| Carbonate ($CO_3$) | 0 | 0 | 0 | 0 |
| Sulfate ($SO_4$) | 0 | 1.2 | 2.0 | 1.6 |
| Chloride (Cl) | 0 | .8 | .5 | 1.0 |
| Fluoride (F) | 0 | .1 | .1 | .1 |
| Nitrate ($NO_3$) | .4 | .2 | .1 | .1 |
| Dissolved solids (calculated) | 37 | 126 | 122 | 111 |
| Hardness (as $CaCO_3$) | 20 | 104 | 99 | 90 |
| Color | 5 | 0 | 0 | 5 |
| pH | 7.1 | 7.5 | 7.8 | 7.0 |
| Specific conductance (micromhos at 25°C) | 50 | 208 | 199 | 181 |

1/ Spring used for Park Ranger's residence supply (NW¼NW¼ sec. 10, T. 40 S., R. 6 W.).

## SUMMARY

Any additional water supplies in the monument area will have to be developed from surface water because the rocks underlying most of the area have low permeabilities and would yield only meager supplies to wells.

Lake Creek and River Styx appear to be sources that can be most easily developed for water needs of the chalet area. Because of the distance from the chalet to the residence area (about 1½ miles by road), separate water systems may be less costly than supplying water to the residence area from the chalet. Water supply for the residence area could be piped from Lake Creek, which would necessitate the construction of additional diversion facilities and of storage and treatment facilities in the residence area.

Estimates of the dependable flow of River Styx and Lake, Panther, and Cave Creeks are tabulated in figure 3.

## REFERENCES CITED

U.S. Public Health Service, 1962, Public Health Service drinking water standards, 1962: Public Health Service Pub. 956, 61 p.

Wells, F. G., and others, 1940, Preliminary geologic map of the Grants Pass quadrangle, Oregon: Oregon Dept. Geology and Mineral Industries, scale 1:96,000.