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PRELIMINARY REPORT ON THE EFFECT OF THE USE OF WATER AT LAKE PILLSBURY
AND AT VAN ARSDALE RESERVOIR ON THE SALMON AND TROUT
OF THE DEL RIVER SYSTEM ✓

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Two dams built on the Del River in Mendocino and Lake counties have profoundly affected conditions for fish life in a large portion of the Del River system. These dams are the Cape Horn Dam, constructed in 1907, located in Township 13 North, Range 11 West, section 30, Mendocino County, which creates the Van Arsdale Reservoir, and Scott Dam, constructed in 1921, located in T. 13 N., R. 10 W., sections 14 and 23, Lake County, which creates Lake Pillsbury. Both of these reservoirs are entirely artificial. Cape Horn Dam, the lower dam, has a fishway over it, while Scott Dam is without a fishway.

Lake Pillsbury is a storage reservoir of the Pacific Gas and Electric Co. Water is released down Del River to Van Arsdale Reservoir, where it is diverted through a tunnel to a power plant at Potter Valley; part is then used for irrigation and the remainder flows into East Branch of Russian River.

Through the major portion of the year the amount of water released from Lake Pillsbury is fairly constant (150 to 185 second-feet) and parallels that diverted from Van Arsdale Reservoir through the tunnel (175 to 190 second-feet). At times during the rainy season, however, the flow is much greater; at other times there is practically no flow, owing to regulation.

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The amount of water released down the Eel River from Van Arsdale Reservoir is quite small during the major portion of the year (1 to 3 second-feet). At times during the rainy season the flow is much greater; at other times as little as 0.4 of a second-foot is released.

How the amounts of water released down the Eel River from Van Arsdale Reservoir would compare to the natural flow at that point is, of course, impossible to state in terms of actual measurements. A reasonably close approximation could be made if gaging-stations were located on the principal tributaries of Lake Pillsbury near their points of entrance to the reservoir, but unfortunately such gaging-stations do not exist. In the absence of such gaging-station records, estimates of flow in some of the streams tributary to Lake Pillsbury, made by Elden H. Vestal and myself on July 29 and August 23 and 24, 1938, during the course of our biological survey of the Eel River system, may shed some light on this controversial point.

Tributary directly to Lake Pillsbury are Salmon Creek, Squaw Valley Creek, Horsepasture Gulch, Salt Spring Creek, Eel River, Rice Fork of Eel River, Packsaddle Creek, and several un-named streams, mostly small.

Tributary to the Eel River between Lake Pillsbury (Scott Dam) and Van Arsdale Reservoir (Cape Horn Dam) are Soda Creek, Benmore Creek, Dashiell Creek, Alder Creek, Bucknell Creek, Trout Creek, and several un-named streams, mostly small.

The drainage area above the gaging-station 500 feet below Cape Horn dam is 347 square miles. The drainage area above the gaging-station on the Eel River at Scotia is 3,070 square miles. From the viewpoint of the amount of drainage area the streams above the two reservoirs do not seem to be of great consequence, in relation to the whole Eel River system, but it must be pointed out that the two drainage areas in this case do not form a valid

basis for the comparison of flows in the two groups of streams. For example, many long streams tributary to the Eel River below Van Arsdale Reservoir, such as Tomki Creek, go almost entirely dry, whereas some of the much shorter streams above Lake Pillsbury, such as Hummingbird Creek, Copper Butte Creek, and Skeleton Creek, ordinarily maintain good flows. The character, as well as the area, of a drainage basin is important in determining amount of flow. A number of the streams in the Eel River drainage basin above Lake Pillsbury have their source at elevations of 5,000 ft. and more and can not rightly be likened to all streams of the same length in other portions of the Eel River drainage basin.

On August 24, the Eel River at the Skeleton Glade-Bloody Rock trail crossing, which is approximately one mile below Cold Creek and eight miles above Lake Pillsbury, at an elevation of approximately 2400 ft., was estimated to have a flow of 3 second-feet. Tributaries of the Eel River between Lake Pillsbury and this point are Thistle Glade Creek (estimated flow August 23, 3.5 second-feet), Hummingbird Creek (estimated flow August 23, 1.25 second-feet), Un-named Creek (estimated flow August 23, 1 second-foot), Copper Butte Creek (estimated flow August 23, 4 second-feet), and Skeleton Creek (estimated flow August 23, 1.5 second-feet). All of these estimates were made at the Elk Mt.-Sheet Iron Mt. road crossings. Added to the flow of the Eel River, a total of 20.25 second-feet is obtained. No diversions of water occur between these points and Lake Pillsbury.

On August 23, the Rice Fork of Eel River at the Elk Mt.-Sheet Iron Mt. road crossing, elevation approximately 2000 ft., was estimated to have a flow of 7 second-feet. This station is below the entrance of Deer Creek into the Rice Fork of Eel River and approximately 5 miles above Lake Pillsbury. Tributaries of Rice Fork below this point are Willow Creek (not seen), Deer

Creek (estimated flow at Elk Mt.-Sheet Iron Mt. road crossing August 23, 2 second-feet), Rice Creek (estimated flow at Elk Mt.-Sheet Iron Mt. road crossing August 23, 5.5 second-feet), Evans Creek (not seen), and several quite small un-named streams (not seen). Exclusive of the streams not seen a total of 14.5 second-feet is obtained.

Salmon Creek was seen on July 29. Approximately two miles above Lake Pillsbury the flow was estimated to be 1 second-foot. Disregarding this stream and Squaw Valley Creek, Horsepasture Gulch, Salt Spring Creek, Packsaddle Creek, and the several un-named tributaries of Lake Pillsbury, we still obtain a total of 34.75 second-feet for the main Eel and the Rice Fork of the Eel above Lake Pillsbury.

It is quite true that these are only estimates of flow, but Mr. Vestal and I have had considerable experience in judging streams flows, so that the figure of 34.75 second-feet may not be expected to be grossly in error.

It is also true that some water may be lost between the points of estimated flow and Lake Pillsbury, due to evaporation and seepage. However, because of the character and location of the terrain, this possible loss may not be expected to be of consequence and is probably at least balanced by the flow from the streams not examined.

On August 23, 1938, the day on which the above estimates of flow were made, the official U. S. Geological Survey record for the flow at the gaging-station half a mile below Scott Dam was 194 second-feet. On the same day, the record for the flow at the gaging-station 500 feet below Cape Horn Dam was 1.7 second-feet. The record for the flow at the gaging-station at the Pacific Gas and Electric Co. Potter Valley power-house tailrace near Potter Valley was 177 second-feet. The contents of Lake Pillsbury on the same day were not recorded, but on August 22 consisted of 74,380 acre-feet. The flow of the Eel River at

Scotia, as recorded at the gage at Wildwood Bridge, half a mile north of Scotia, was 105 second-feet.

As nearly as the picture may be drawn then, on August 23, 1938, approximately 35 second-feet was entering Lake Pillsbury, 194 second-feet was being let out of Lake Pillsbury and flowing into Van Arsdale Reservoir, plus minor contributions from Trout, Bucknell, Alder, Dashiell, Benmore, and Soda creeks, 177 second-feet was being diverted into the Russian River drainage basin, and 1.7 second-feet was allowed to pass into the Eel River below Van Arsdale Reservoir. With due allowance for evaporation, seepage, and errors of estimate of flow, it is apparent that considerably more water was entering Lake Pillsbury and would have constituted the natural flow of the Eel River below the site of Van Arsdale Reservoir than was being released down the Eel River from Van Arsdale Reservoir. These data are listed in tabular form in Table 1.

This picture is probably representative of conditions existing at these points during the dry season. The amounts flowing into Lake Pillsbury and let out of Van Arsdale Reservoir into the Eel River vary with rainfall conditions, while the amount let out of Van Arsdale Reservoir into the Russian River drainage basin now remains a near-constant of 175-190 second-feet (average discharge 16 years, October, 1922 to September, 1938 is 195 second-feet) through the major portion of the year. The minimum flow passing the dam at Van Arsdale Reservoir down the Eel River during the water year 1937-38 was 0.4 of a second-foot (June 25, 26).

TABLE I. STREAM-FLOWS (IN SECOND-FEET) INTO AND OUT OF LAKE PILLSBURY AND VAN ARSDALE RESERVOIR, AUGUST 23, 24, 1938.

Entering Lake Pillsbury:

1. Via Eel River and tributaries:

Eel River 8 mi. above Lake Pillsbury	9	Aug. 24, 1938
<u>Tributaries of Eel R. below above point:</u>		
Thistle Glade Creek	3.5	Aug. 23, 1938
Hummingbird Creek	1.25	Aug. 23, 1938
Un-named Creek	1.0	Aug. 23, 1938
Copper Butte Creek	4.0	Aug. 23, 1938
Shelston Creek	1.5	Aug. 23, 1938
	<u>20.25</u>	

2. Via Rice Fork of Eel River and tributaries:

Rice Fork of Eel River 3 mi. above Lake Pillsbury	7	Aug. 23, 1938
<u>Tributaries of Rice Fk. Eel R. below above point:</u>		
Willow Creek (not seen)	2	Aug. 23, 1938
Deer Creek	5.5	Aug. 23, 1938
Rice Creek		
Bevans Creek (not seen)		
Un-named small streams (not seen)		
	<u>14.5</u>	

3. Via miscellaneous tributaries of Lake Pillsbury:
(Not seen on August 23 or August 24.)

Total amount entering Lake Pillsbury via Eel River and Rice Fork of Eel River	34.75	Aug. 23, 24, 1938
Amount let out of Lake Pillsbury	194	Aug. 23, 1938
Amount diverted into Russian River system	177	Aug. 23, 1938
Amount let down Eel River	1.7	Aug. 23, 1938
Capacity of Lake Pillsbury (without flash-boards)	72,045	acre-feet
Capacity of Lake Pillsbury (with flash-boards)	93,724	acre-feet
Contents of Lake Pillsbury, August 22, 1938	74,380	acre-feet