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RECOMMENDED MINIMUM FLOWS  
BELOW WICKIUP RESERVOIR

by

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In October of 1947 the Bureau of Reclamation notified the Oregon State Game Commission and the U. S. Fish and Wildlife Service that they planned to reduce the flow of the Deschutes River below Wickiup reservoir from about 650 second feet by stages, in order to store 180,000 acre feet of irrigation water. The effects of such a drastic reduction of flow on the ecology of the stream and the sports fishery involved are of great importance.

*(Omitted)  
by error*

Fifteen miles of the Deschutes River below Wickiup dam, in which no major tributary enters, would be affected by the reduced discharge.

Mr. R. C. Holloway of the Oregon Game Commission and Dr. L. E. Perry of the U. S. Fish and Wildlife Service made preliminary observations in this section on October 21 and November 3, 1947. Further observations were made by the authors on November 13 and 14 and on December 2. Arrangements were then made with the Bureau of Reclamation to release water at three pre-arranged levels on December 9, 10, and 11. These flows were 291 second feet, 100 second feet, and 50 second feet. In company with Mr. Breckenridge of the Bureau of Reclamation, stations were established at representative locations along 8 miles of the river immediately below the dam.

A series of lateral and vertical measurements were made at each station at each water level. ( See accompanying photographs )  
( This report is prepared with the cooperation of the Fish and Wildlife Service )

The appended photographs are the basic material from which recommendations and conclusions were derived.

Fluctuating stream levels are detrimental to fish life in several respects, and to reduce these effects to a minimum, still keeping in mind irrigation needs, it is recommended that the flow of the Deschutes river below Wickiup dam never be reduced to less than 200 second feet. Furthermore, in reducing the flow to this level, the process should be gradual.

A rapid reduction reduction in stream flow traps fish in side pockets where they are killed directly by dessication or lack of oxygen, or are made easy prey for predators. The earlier phases of this investigation revealed several instances of this in the area involved.

Another way in which fluctuating flows harm the fishery is by interference with spawning activities. Trout spawn in relatively shallow water over gravel beds. Lowering of stream levels after spawning results in exposure of the beds and dessication of the eggs. Of course lowering of the water before spawning nullifies all exposed gravel that otherwise be used for spawning beds. Raising the water level after spawning has taken place will, in some locations, result in smothering the eggs by a deposition of silt, and in any case will result in the swimmer-ups being more than normally exposed to predation as they leave the nests. The section of stream in question contains brown trout that spawn in

the fall at about the same time that water levels will be reduced. Spring spawning rainbow trout will be subject to the hazards of rising water after irrigation begins. A third source of danger to the fishery under such a reduced flow is freezing of bottom areas which have very little current with possible oxygen depletion as an accompanying condition.

A fourth and very real loss incurred by drastic reduction in stream level is loss of production potential. The part of the stream bed that will produce trout foods is only that part continuously covered with water. Any part periodically exposed is removed from production. At a flow of 50 second feet approximately one third of the stream bed is exposed, which, in the fifteen miles involved, amounts to 54.5 acres. The Deschutes is very rich in trout foods and it is believed that 26,145 pounds of such food would be lost with this area periodically dessicated. This amount of food could produce 5,229 pounds of trout which would cost \$7,320.60 to produce in a hatchery. At a value to the sportsman of \$5.00 per pound, the production lost would have an annual value of \$26,145.

It was determined during this investigation that 300 second feet of water are necessary to cover the whole bottom of the river. However, in view of the need for a large amount of irrigation water, it is believed that 200 second feet would be a reasonable compromise on the level below which the Deschutes should never be allowed to drop. This will allow good food production in conjunction with little interference with spawning. If the water is lowered to this level gradually, and never allowed to go below it, the damage to the sports fishery should not be excessive.

Summary - Supplement to Report on  
Recommended Minimum Flows below Wickiup Reservoir

I. Exposure of stream bed and loss of fish foods

Mileage actually 21 miles rather than 15 estimated in 1947 report -  
Thus increases acreage uncovered to 85.2 acres and 40,910 pounds of  
trout food lost at a minimum flow of 50 c.f.s.

Table 1

losses in production of fish food and trout  
at various minimum flows

Flow in cubic feet per second	Per cent bottom exposed	acres exposed	Pounds of trout food lost	Pounds of trout lost	Production cost of trout lost
25	46.0	109	52,200	12,200	15,249
50	36.0	85.2	40,910	9,514	\$11,892.50
100	30.0	71.0	34,092	7,928	9,991.00
200	9.2	21.8	10,467	2,434	3,042.00
300	Negligible	Negligible	Negligible	Negligible	Negligible

II. Economic evaluation

An evaluation of income to the people of the state and particularly  
of Bend and Central Oregon for the 21 mile section is estimated from  
a study conducted on 32 mile section of Deschutes above Bend in 1950.  
That section contributed almost \$2,000 per mile to the state in  
expenditures or about \$42,000 annual income in the section below  
Wickiup Reservoir.

III. Waterfowl

Wickiup Reservoir itself has removed the impoundment area from  
waterfowl nesting by flooding a river section formerly supporting a  
waterfowl production.

Below the dam fluctuating water levels destroy waterfowl nests, and  
reduces the nesting population even though some re-nesting occurs.

IV. Furbearers

The increase in water flows each spring catches young muskrat in dens and consequently many are drowned.

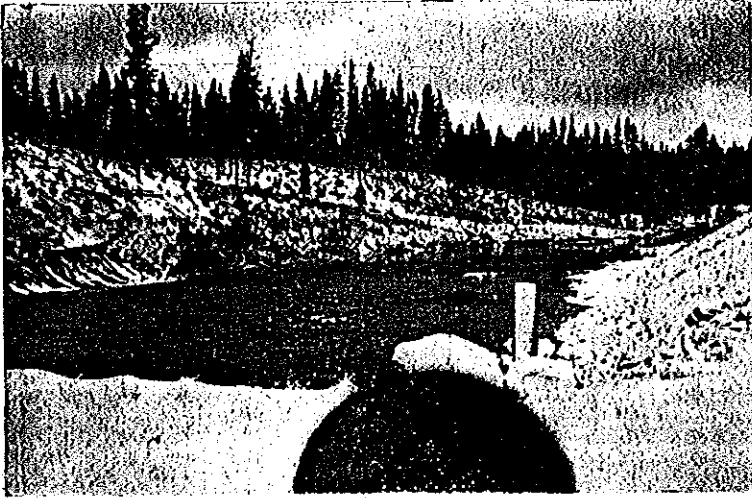
V. Summer-home and resort facilities

Elks Lodge summer home area on the Deschutes River below Wickiup has 16 homes valued at approximately \$31,000 and sites for more which potentially could increase the evaluation to \$100,000.

Spring River, Fall River and South Twin Resorts derive a portion of their income from anglers utilizing the area and actually arrange boat fishing trips for customers to the Deschutes between Wickiup and Fall River.

*Dec 1953 - LMM*

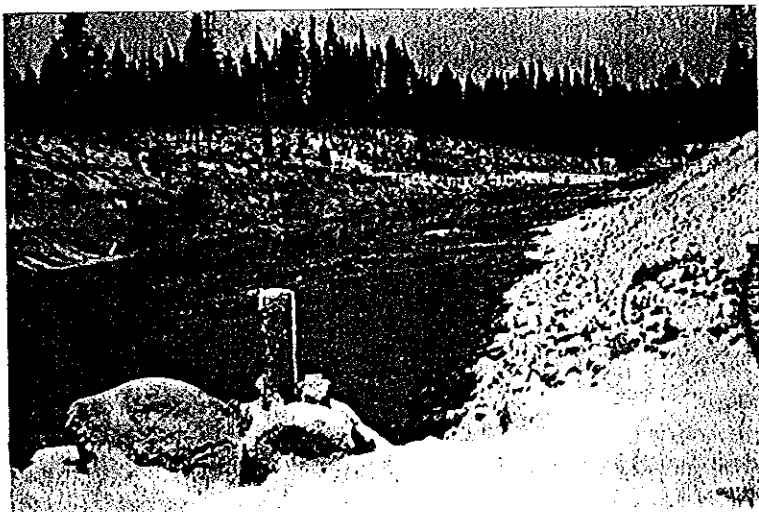
Downstream view of Deschutes River immediately below Wickiup Dam



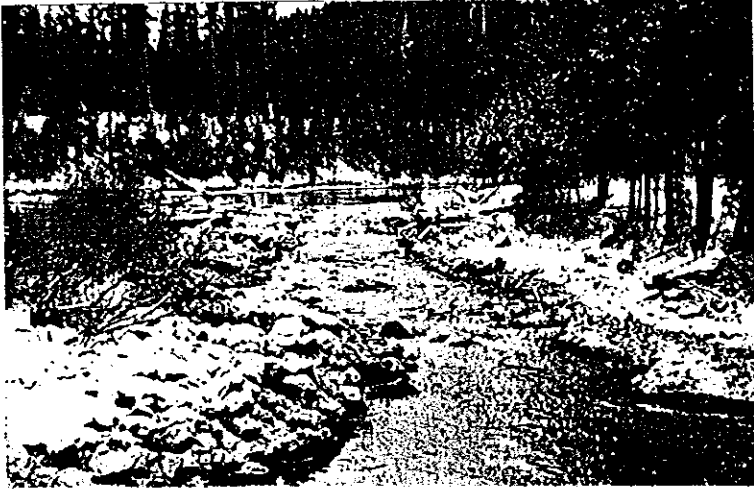
Flow at 291 c.f.s.



Flow at 100 c.f.s.



Flow at 50 c.f.s.



Upstream view from Pringle Falls  
Bridge. 50 c.f.s.



Isolated pools 5 feet deep.  
 $\frac{1}{4}$  mile below Pringle Falls.  
This hole contained numerous  
stranded white fish at 50 c.f.s.  
At 200 c.f.s. this pool would  
be connected with the river.

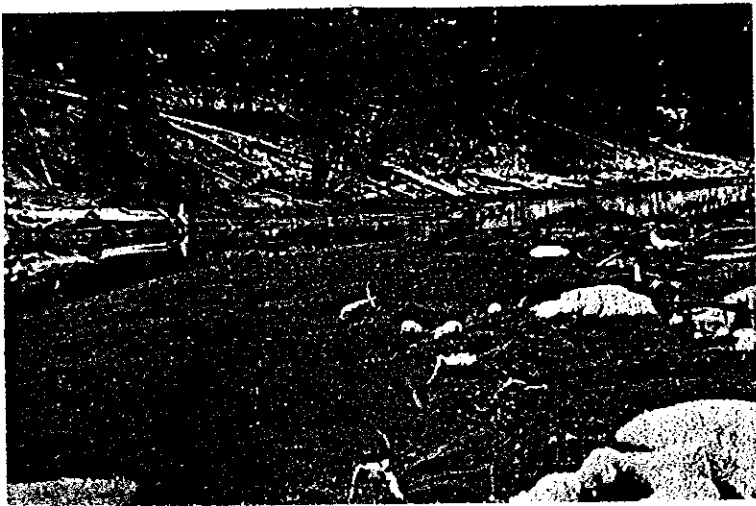


3 miles upstream from Pringle Falls  
at 300 c.f.s.

Station No. 1. 3 miles below dam



Flow at 291 c.f.s.



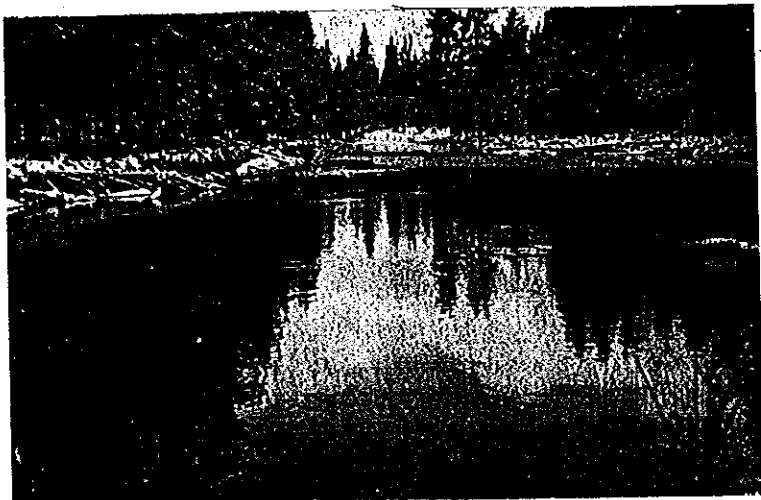
Flow at 100 c.f.s.



Flow at 50 c.f.s.



Station No. 2. 2.7 miles below dam



Flow at 291 c.f.s.



Flow at 100 c.f.s.



Flow at 50 c.f.s.

Station No. 3. 5 miles below dam, 3 miles above Pringle Falls



Flow at 291 c.f.s.



Flow at 100 c.f.s.



Flow at 50 c.f.s.

Station No. 4.  $6\frac{1}{2}$  miles below dam,  $1\frac{1}{2}$  miles above Pringle Falls



Flow at 291 c.f.s.



Flow at 100 c.f.s.



Flow at 50 c.f.s.

Deschutes River Station 4  
Pringle Falls



#1

7-30-59

2000 cfs<sup>+</sup>



#2

12-4-59

25 cfs<sup>+</sup>

Deschutes River Station 1  
Wickiup Dam

#1  
7-30-59  
2000 cfs.



#2  
12-4-59  
25 cfs

