

CASE STUDY REPORT #26*
FRENCH MEADOWS RESERVOIR -
MIDDLE FORK AMERICAN RIVER

I. Project Description

French Meadows Reservoir is a part of the Placer County Water Agency Middle Fork American River project as generally described in the feasibility report prepared by McCreary-Koretsky Engineers (July 1961). The development of the river as viewed in this report and the placement of French Meadows Reservoir is shown in Figure 1. (The 1975 development is not exactly as shown in Figure 1, but the differences do not affect the case study.) Pertinent project statistics for French Meadows are given in the attached project inventory form.

In addition to natural inflow, water is diverted through tunnels from Duncan Creek into French Meadows. Outflow from this reservoir is into the Middle Fork American River and through the French Meadows power plant to Hell Hole Reservoir. Natural inflow to French Meadows Reservoir, which is at an elevation above 5,200 feet, is mostly snowmelt. The watershed is coniferous forest (pine, cedar and fir) on shallow soils, decomposed granite and granite rock. Canyon walls are precipitous. Outflow from the reservoir responds to the water year, project purposes and an in-stream flow for fish.

* Project reference number per key map and data charts, Task 1 report.

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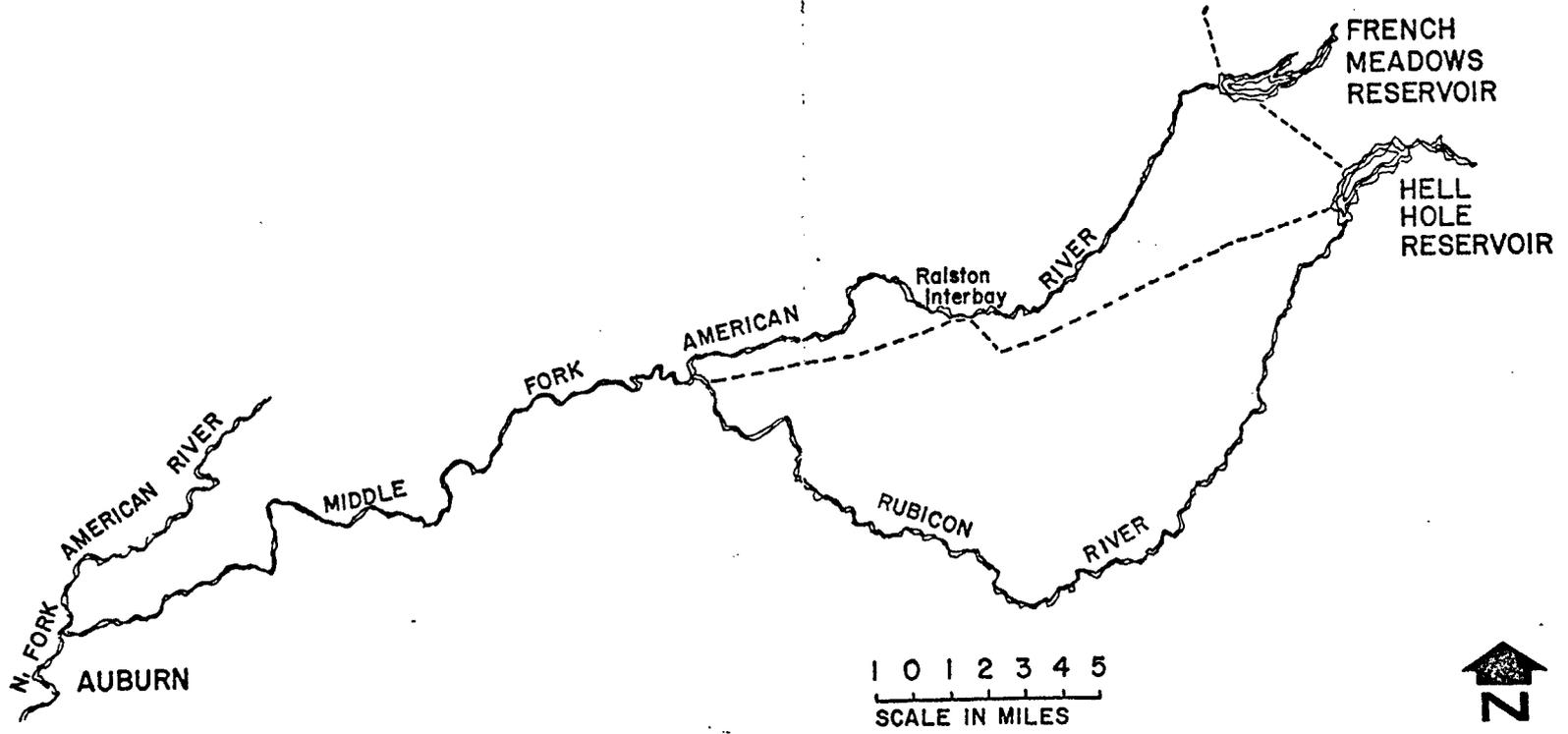


Figure 1
LOCATION MAP

Source: McCreary Koretsky Engineers, 1961.

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II. Pre-Project Conditions

During the years preceding 1965, estimates were made of stream flow through the French Meadows site. Natural river flow conditions for the period 1925-1958 were initially compiled by the Placer County Water Agency. Subsequently, the Department of Fish and Game used 1951-1960 as base water years, probably to shorten computations. Pre-project mean monthly and the minimum recorded monthly discharges (1951-1960) are shown in Figure 2. The mean discharge pattern illustrates a response to early winter rainfall and snowmelt, snowmelt and freezing conditions between January and March, and peak snowmelt runoff from April to June. Summer and early autumn stream flows result mainly from subsurface accretions to stream flow. Great variation occurs depending on the water year, the rapidity of snowmelt and intensity of rainfall.

Peak flows in spring and low flows in autumn are assumed to have determined the nature of the physical habitat and thereby dominated community structure and fish productivity. Stream bottoms were scoured annually to the detriment of riparian and in-stream habitat. Since high flows occurred during the rainbow trout reproduction and nursery period, these activities were probably impaired and limiting to the fish population. The relative annual success in use of spawning and nursery habitat was probably inverse to stream flows in the spring.

Low late summer flow, sometimes less than 1 cfs, certainly restricted habitat in terms of space and food supply. Records of pre-project fish population sizes were not discovered. The available information indicates that 4-8 inch rainbow trout were numerous, but there were probably few larger fish. The Department of Fish and Game (DFG) periodically stocked the Middle Fork of the American River with trout. The river at the reservoir site was accessible for camping and fishing.

III. Project Development

The earliest recorded concern about in-stream flow in the French Meadows reach of the river appeared in DWR Bulletin No. 21 where the department requested a minimum of 5 cfs year-round. No explanation is offered about why 5 cfs was chosen. Subsequent to this time there were unrecorded meetings between the DFG and the consulting engineers representing Placer County Water Agency. Apparently these meetings concerned both normal and dry year water releases. In October 1958 DFG wrote the engineers concerning their desire not to have dry year flow reductions. In October 1958 DFG asked for 10 cfs from May 1 to October 31 and 5 cfs from November 1 to April 30. No explanation for these choices was discovered.

Beginning in the summer of 1961, DFG began field investigations to more accurately assess in-stream flow needs at French Meadows. During June, July and August temperatures were measured and found to range from 53 to 70°F. Eight years of stream flow

data (1951-1960) were compiled and tabulated for mean and minimum monthly flow in cfs (see Figure 2). Sometimes late summer-early autumn flows were less than 1 cfs.

To assess relationships between flow and fisheries habitat, one reach of stream was studied using nine transects spaced about 10 feet apart at four flows (3, 9, 17 and 28 cfs). This was done during June, July and August 1961. Water depths and habitat characteristics were recorded along each transect and transferred to sketch maps. Stream depths at the four flows ranged as shown:

3 cfs	0.1-1.45 feet
9 cfs	Not tabulated
17 cfs	0.4-1.8 feet
28 cfs	0.6-1.9 feet

Habitats related to depth and physical appearance were cover, spawning and food. The wetted area was also noted. The results of these analyses are shown in Figure 3. From these results and their general knowledge about the stream, DFG concluded:

Conclusions

- "I. The test section shows little or no spawning area below 17 cfs -- 15 cfs would appear to be the minimum flow that would provide any spawning.
- "II. Above 17 cfs there is a reduced rate of food-area increase, therefore 17 cfs appears to be close to the optimum flow for providing adequate food production area.
- "III. Above 9 cfs there is a reduced rate of increase in cover, therefore about 9 cfs appears to be a critical change in cover. One might conclude 9 cfs would be approaching optimal conditions.

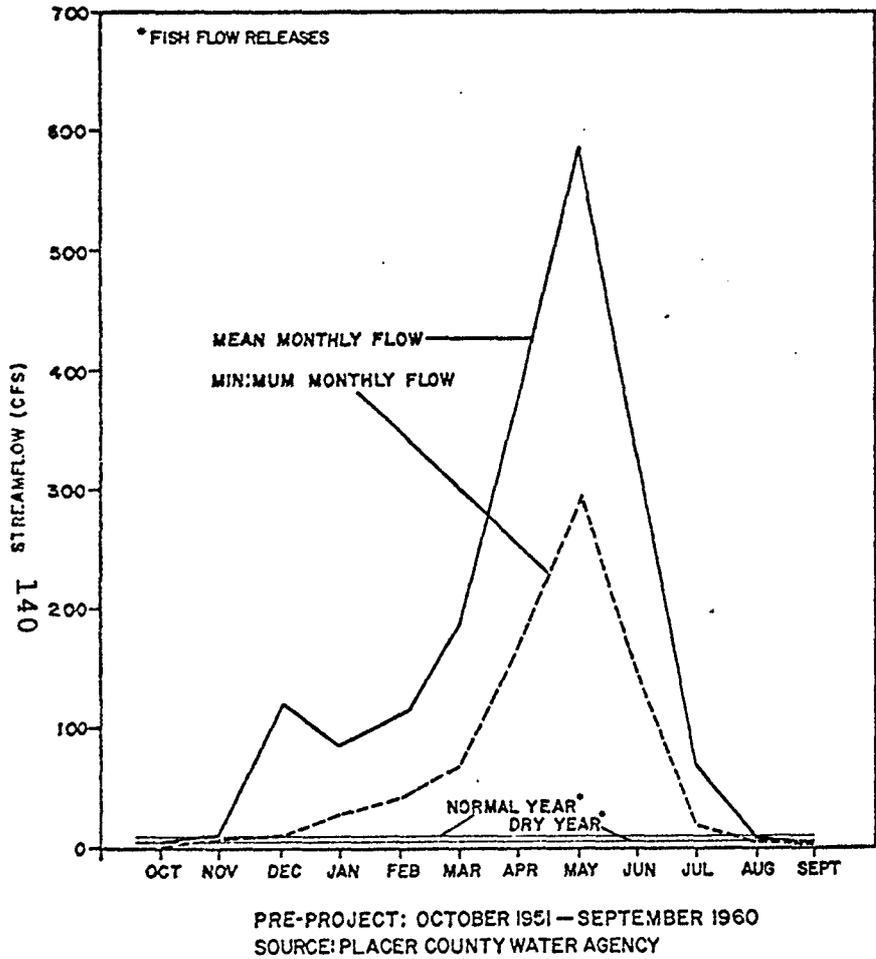
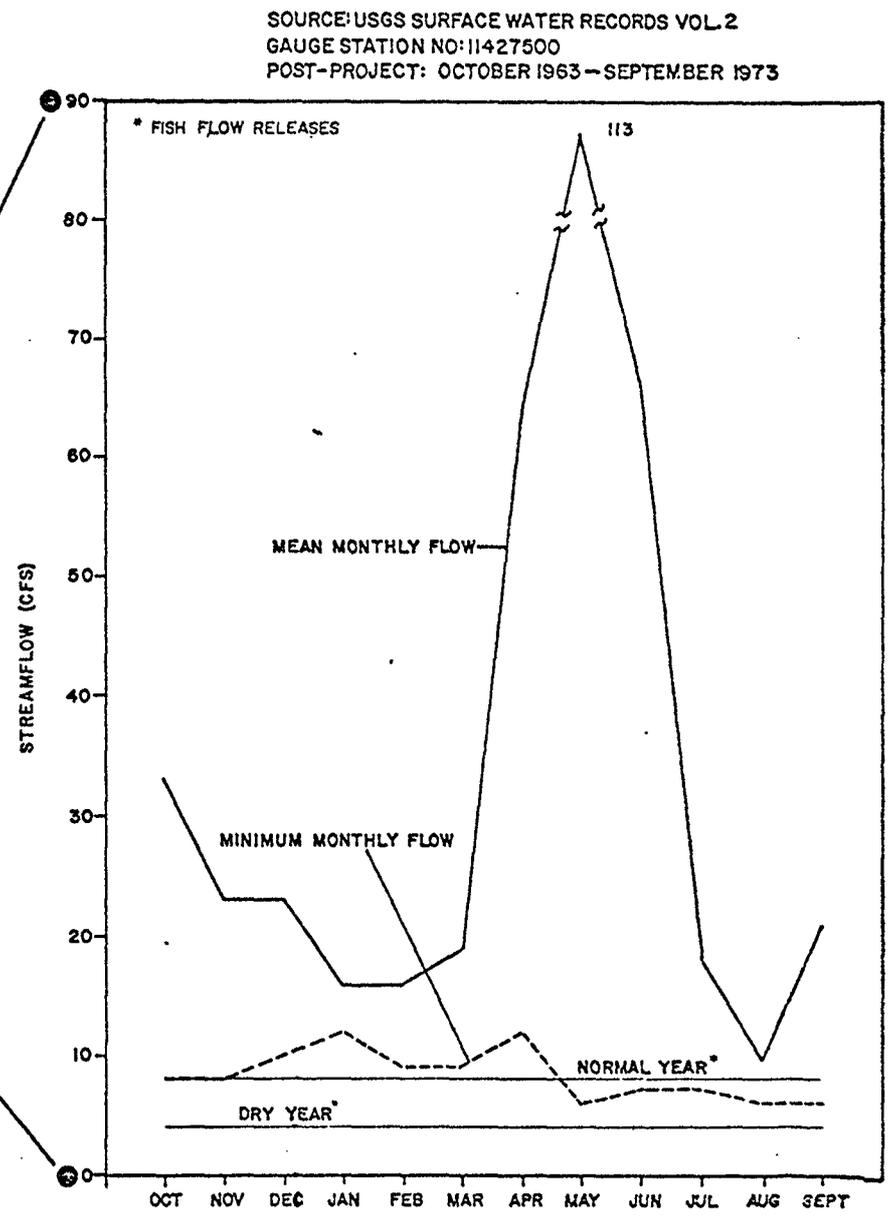


FIGURE 2
STREAMFLOW CONDITIONS, MIDDLE FORK AMERICAN RIVER BEFORE AND AFTER CONSTRUCTION OF FRENCH MEADOWS RESERVOIR



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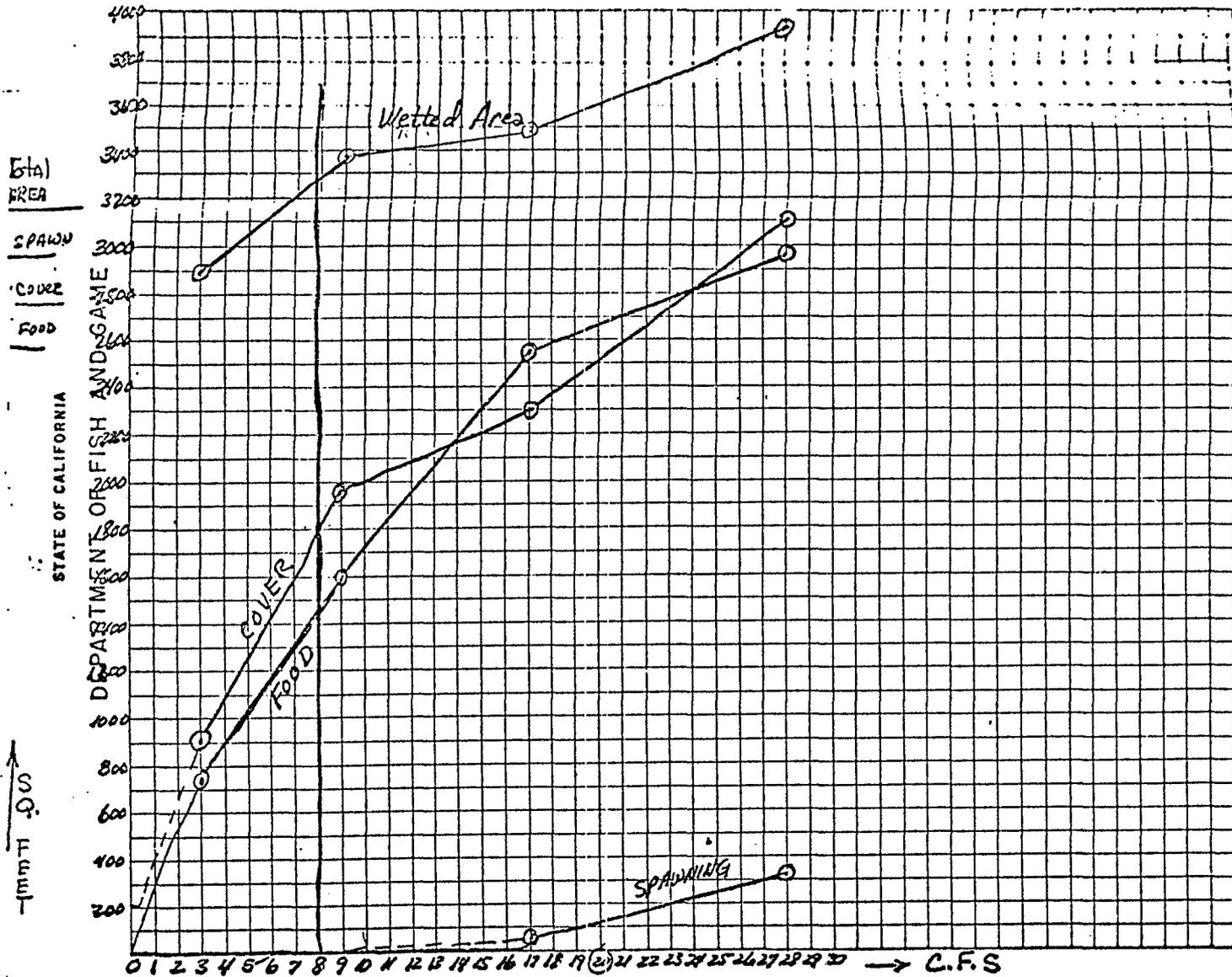


Figure 3

RESULTS OF STREAM TRANSECT STUDY

Adapted from: California Department of Fish and Game "Stream Files"
Middle Fork American River, 1976.

"IV. If we knew which was most critical (food or shelter), we could pick either of the optimal flows.

"VI. If we do not know, perhaps the average of 9 and 17 or + 13 cfs might provide little less food-area than optimum, but a little more than optimum in amounts of shelter.

"In summary, the data seems to indicate that 17 cfs for spawning and 13 cfs for food and shelter are required."

Based on these studies, DFG informed the water agency that maintenance of the fishery required 20 cfs or the natural flow, whichever is less.

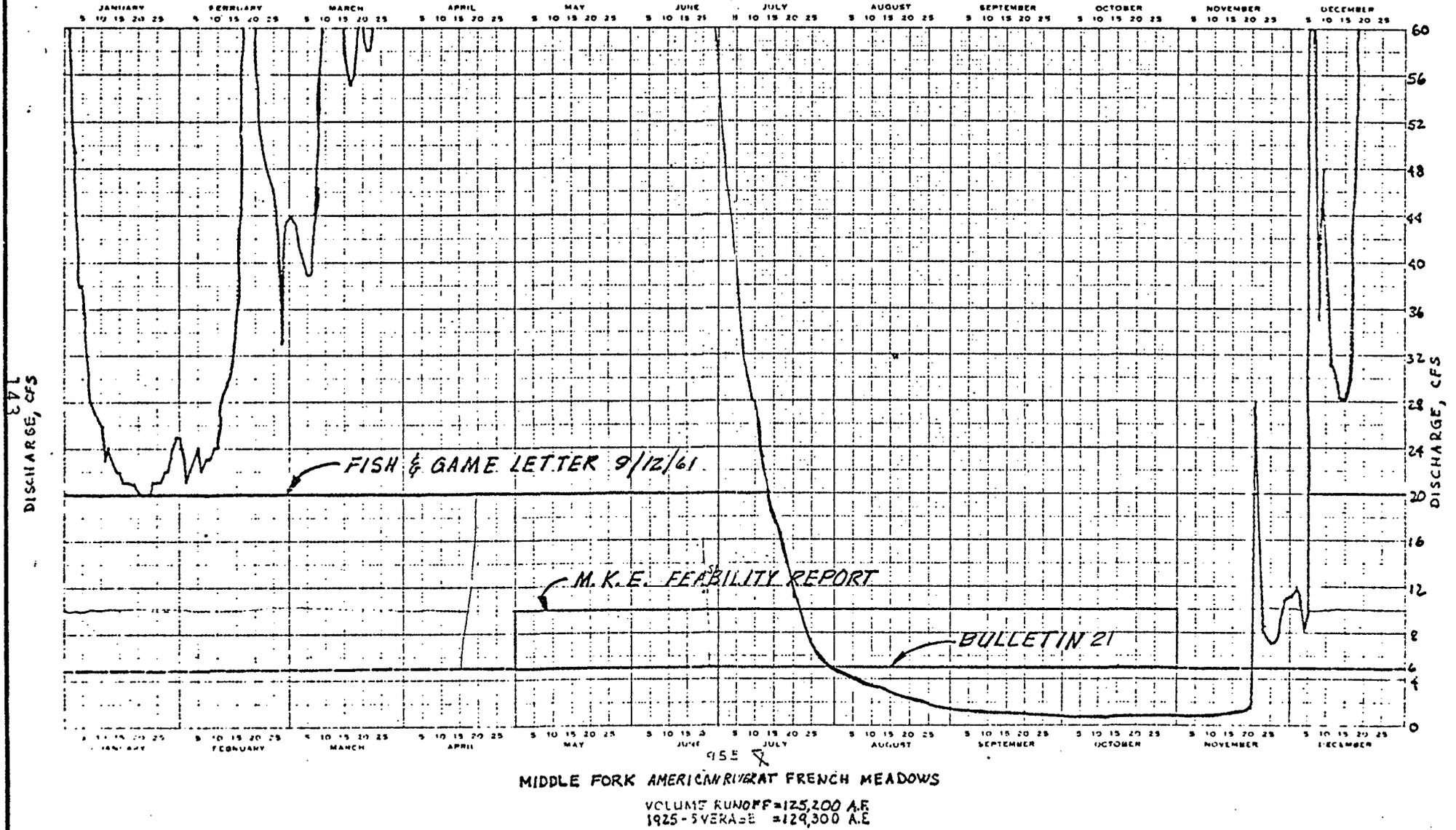
The water agency performed a reservoir operational study to assess their ability to provide releases for fish. The results of various flows under consideration at that time (September 1961) were prepared in graphical form by the water agency in comparison to a 25-year historical flow (Figure 4). The 5 cfs noted in Bulletin 21 is the original DFG request. The McCreary · Koretsky · Engineers feasibility report flow is the result of the water agency's operational study and the most recent DFG request.

Subsequently DFG was asked to alter their 20 cfs request and come up with a release schedule relative to the availability of water as promulgated by the water agency. Based on undated notes, the department arrived at the following release schedule:

	Normal & Wet Years	Dry Years (less than 1.5 x 10 ⁶ acre-feet at Fair Oaks Gauge)
Jan. 1 - Apr. 1	10 cfs	5 cfs
Apr. 15 - Apr. 20	15	7
Apr. 20 - June 25	20	10
June 25 - July 1	15	7
July 1 - Jan. 1	10	5

Figure 4

DISPLAY OF DIFFERENT POSSIBLE ALLOCATIONS OF WATER FOR FISH



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Source: McCreary-Koretsky Engineers, 1961.

Apparently after further negotiations, DFG and the Placer County Water Agency entered into an agreement before the State Water Rights Board (July 30, 1962) which in part agreed to the following minimum in-stream flows:

1. Normal or wet years: 8 cfs at all times.
2. Dry years (less than 1×10^6 acre-feet at Folsom):
4 cfs at all times.
3. The department and the agency agree that in the event changes in the above releases are deemed desirable to improve fishery and recreational volumes, the flow schedules may be changed, provided both parties agree to the change and the total amount of water released does not exceed 5,800 acre-feet in a wet year and 2,900 acre-feet in a dry year.

IV. Post-Project

Insofar as is known, the agreement has not been changed. Figure 2 shows mean, maximum and minimum monthly flows 0.6 mile below French Meadows Reservoir during the 1963-73 period. During the minimum flow year 1972-73, summer flows were less than the agreed to 8 cfs. It is unrecorded whether or not this was a dry year.

The first year after the dam was operational, Eric Gerstung, a DFG biologist, surveyed (August 25, 1965) the river below the reservoir and found the river to still be under the influence of the construction period. Over three sample sections, he collected

three rainbow trout fry and one 9.6-inch brown trout. Environmental conditions for trout appeared favorable and the collection of the rainbow trout fry indicated that reproduction was successful.

Angling surveys made by the Department of Fish and Game personnel between 1965 and 1970 downstream from French Meadows indicate that the river supports a fair to good small rainbow trout up to about 9 inches long and brown trout up to about 12 inches long with abundance progressively increasing downstream. Iron ochre deposition within the first half mile of stream below the dam has inhibited fish production in this area.

V. Conclusion

The operation of French Meadows Dam has altered the natural streamflows of the Middle Fork of the American River. Historically, mean monthly flows ranged to 800 cfs. After French Meadows Dam was constructed, mean monthly flows rarely exceeded 100 cfs (see Figure 2). Although operation of French Meadows Dam has greatly reduced peak instream flows, historic minimum flows of less than 1 cfs have remained above 4 cfs in dry years and in normal water years above 10 cfs.

The historic wide range in flow (800 cfs to 1 cfs) has been changed by the project. Mean monthly flows released from French Meadows in a normal year generally range from 100 cfs to 10 cfs. This change in instream flow is assumed

to have altered the physical habitat. Post-project instream flow releases have been maintained well above the minimum instream flow reservoir.

Beginning in 1961, the Department of Fish and Game began field investigations to assess instream flow needs at French Meadows. During June, July and August, temperatures were measured. Eight years of hydrologic instream flow data were compiled and tabulated for mean and minimum monthly flows in cfs. To assess relationships between flow and fisheries habitat, one reach of stream was studied using nine transects spaced about 10 feet apart at four flows (3, 9, 17 and 28 cfs). Water depths and habitat characteristics were recorded along each transect and transferred to sketch maps. Wetted areas and habitats relating to food, cover and spawning areas were noted. From these results and their general knowledge about the stream, the Department of Fish and Game recommended a fishery maintenance flow of 20 cfs or the natural flow whichever is less. The agreed to releases for fish are thought to be a compromise that slightly improved the late summer flows over historical conditions.

Although no evidence was found, it is speculated that fish and wildlife habitat below French Meadows Reservoir may have improved because of the project, if one considers stability and diversity as improvement. Late summer flows have been improved over the historical condition and although the stream channel is not fully wetted, conditions for fish, cover and

food are improved. Flows during the spring spawning period are less than what the Department of Fish and Game judged adequate for rainbow trout, but are more than adequate for the fall spawning of brown trout.

The available data and information indicate that DFG requests for in-stream flow were generally based on their judgment relating mostly to historical low summer flow, the availability of water from the project as determined by the water agency and the habitat possibilities for trout. Although stream transect studies were done, the results mostly intensified DFG judgments about habitat possibilities and lent some credence to their requests in negotiations with the water company.

Angling surveys made by DFG personnel between 1965 and 1970 downstream from French Meadows indicate that the river supports a fair to good fishery for small rainbow trout up to 9 inches long and brown trout up to 12 inches with abundance progressively increasing downstream. Exposure of iron ochre deposition within the first half mile of stream below the dam has inhibited fish production in this area. This situation was unforeseen in evaluation of the instream flow needs below French Meadows Dam.

BIBLIOGRAPHY

Personal Communications

Gerstung, Eric. 1975. Associate Fishery Biologist, California Department of Fish and Game.

Lundlof, Ray. 1975. State of California Water Rights Board.

Meyer, Fred. 1976. Associated Fishery Biologist, California Department of Fish and Game.

Wooster, Theodore. 1975. Environmental Services Supervisor, California Department of Fish and Game.

References

California. Department of Fish and Game. 1956. Report on water rights application affecting fisheries, wildlife and recreational resources of the American River basin. 41 pp.

Gerstung, Eric. 1970. Fish population and yield estimates from selected California trout streams. 44 pp.

McCreary, Koretsky Engineers. 1961. Feasibility report Placer County Water Agency Middle Fork American River project. 70 pp.