

1977
TUOLUMNE RIVER
FISH POPULATION SURVEY

Richard L. Ridenhour
Consulting Fishery Biologist

24 September 1977

During the week of 19-23 September 1977 the Fish and Wildlife Service conducted, in cooperation with the Forest Service, the National Park Service, and the California Department of Fish and Game, a survey of the fish population in the Tuolumne River between O'Shaughnessy Dam and Early Intake. This survey was intended to replicate the survey that had been conducted in 1970. I observed and photographed the activities on 19, 20, and 21 September when the two downstream sites of the four sites were sampled. In addition, I looked at and photographed the areas where the two upstream sites are located.

The four sites to be used in this fish population survey were the same ones sampled in 1970:

1. The first site is located between the release of water immediately below O'Shaughnessy Dam and the access road bridge. Much of the area would seem to be a long, relatively shallow pool with possibly one fairly short area of riffle or cascade through moderately sized (3 to 6 foot diameter) boulders. The precise boundaries of this site are not known to me.
2. The second site is located between Transect #1 used in the Fish and Wildlife Service Flow Study (this transect is about 200 yards below the upstream gaging station and was originally Transect #2) and the large, circular pool located a short distance above Poopenaut Valley. Immediately below Transect #2 is a long, deep pool. I presume the sampling site starts immediately below this pool and extends to a short distance upstream from the large, circular pool. This area includes short, steep cascades through large boulders and bedrock and relatively short, moderately deep pools.

3. The third site is located in the lower portion of the gorge between Moopenaut Valley and Preston Meadows. It is just within Yosemite National Park. This site is roughly 150 yards long and includes rubble riffle areas and one small pool. There are large, relatively shallow pools immediately above and below the site. The habitat within this site appears to be more diverse than at the other sites.
4. The fourth site is located at Transect #5 (originally Transect #6) used in the Flow Study. It is adjacent to Indian Meadows downstream from Preston Meadows and about 1.5 miles upstream from Kirkwood Power House. The upper end of the site is a steep cascade through small boulders. A moderately large pool (large for this portion of the stream - the next pool of consequence is about a mile downstream at the gaging station) makes up most of this 100-120 yard long site. It ends just below the pool in a run through large boulders.

The schedule (attached) provided for sampling the Indian Meadows site first and then proceeding upstream. Each site was to be blocked off using fine mesh nets (for the most part 1/8-inch bobinette nets were used), a rotenone based fish poison (Prolox fish) was to be applied at the upstream end of the site to kill all of the fish within the site, and potassium permanganate was to be applied immediately below the site to neutralize the toxicity of the poison. The site was to be searched to recover as many of the dead fish as possible. At the site immediately below O'Shaughnessy Dam and at the Indian Meadows site a known number of marked fish (from Occasin Hatchery) were to be introduced prior to the poisoning in order to establish a rate of recovery of dead fish since it was anticipated that it would be practicably impossible to find and count all of the fish that would be killed within the site.

The Prolox Fish was to be introduced at a rate intended to maintain about 1 to 1.5 parts per million of toxicant in the site. The potassium permanganate was to be introduced at a rate of about 1 part per million. The flow of the river had been reduced from 75 cfs to 35 cfs on 16 September in accordance with the intent

flow schedule requirements (the gage reading just above Marly Intake on the morning of 20 September indicated a flow of 42 cfs and this flow was used to calculate the rate of introduction of the Pro Nox Fish). The Pro Nox Fish was introduced at a rate of 2 ounces per minute for approximately one hour. The potassium permanganate was introduced as soon as the Pro Nox Fish reached the downstream block net and was continued for about 15 minutes after the poisoning had been stopped.

The block nets were placed in position at the Indian Meadows site and 257 marked rainbow trout (196 small - about 4 inches, 51 medium catchables - 6 to 8 inches, and 10 large catchables - 10 to 12 inches) were stocked throughout the site during the afternoon of 19 September. The water temperature that afternoon was about 58° (there was a complete cloud cover and it rained intermittently all day). They had some trouble placing the block nets because of the leaves and other debris in the water that had apparently been increased because of the rains. It became necessary to install additional nets to catch the debris and to protect the block nets (even this added protection was not entirely successful since the downstream nets, the protecting net and the block net, were pushed down so that water was flowing over them by the next morning - how many fish, particularly the planted fish, might have escaped from the area is not known although the recovery of marked fish was substantially below the 1970 rate).

The Indian Meadows site was sampled on 20 September. Pro Nox Fish was introduced from about 11:25 am until 12:30 pm. Fish were collected with dip nets and one person was using snorkel equipment and a wet suit. Five species of fish were collected from the site:

Rainbow trout (wild)	39	
Rainbow trout (planted)	163	(3 more were found dead in the block net before poisoning started and 3, at least two of which were planted fish, were found in a large brown trout)

3. The third site is located in the lower portion of the gorge between Poopenaut Valley and Preston Meadows. It is just within Yosemite National Park. This site is roughly 150 yards long and includes rubble riffle areas and one small pool. There are large, relatively shallow pools immediately above and below the site. The habitat within this site appears to be more diverse than at the other sites.
4. The fourth site is located at Transect #5 (originally Transect #6) used in the Flow Study. It is adjacent to Indian Meadows downstream from Preston Meadows and about 1.5 miles upstream from Kirkwood Power House. The upper end of the site is a steep cascade through small boulders. A moderately large pool (large for this portion of the stream - the next pool of consequence is about a mile downstream at the gaging station) makes up most of this 100-120 yard long site. It ends just below the pool in a run through large boulders.

The schedule (attached) provided for sampling the Indian Meadows site first and then proceeding upstream. Each site was to be blocked off using fine mesh nets (for the most part 1/8-inch bobinette nets were used), a rotenone based fish poison (Pro Nox Fish) was to be applied at the upstream end of the site to kill all of the fish within the site, and potassium permanganate was to be applied immediately below the site to neutralize the toxicity of the poison. The site was to be searched to recover as many of the dead fish as possible. At the site immediately below O'Shaughnessy Dam and at the Indian Meadows site a known number of marked fish (from Moccasin Hatchery) were to be introduced prior to the poisoning in order to establish a rate of recovery of dead fish since it was anticipated that it would be practicably impossible to find and count all of the fish that would be killed within the site.

The Pro Nox Fish was to be introduced at a rate intended to maintain about 1 to 1.5 parts per million of toxicant in the site. The potassium permanganate was to be introduced at a rate of about 1 part per million. The flow of the river had been reduced from 75 cfs to 35 cfs on 16 September in accordance with the interim

Brown trout	32
Suckers	205
Sculpin	18
Roach	13

The recovery rate of marked fish (163/257) was 63 per cent as compared with 80 per cent in 1970. This reduced rate might have been the result of marked fish escaping over the block net before poisoning started (I found one dead marked fish downstream of the sampling site after the poisoning had been completed). Therefore, the validity of the recovery rate is questionable. Only about 2 rainbow trout and 4 or 5 brown trout appeared to be of in the "catchable" size range (over 6.5 inches) which is substantially fewer than the number caught in 1970. How the total catch of trout compares with the 1970 sampling will depend on the recovery rate that is used. The Fish and Wildlife Service measured all trout and some of the other fish.

Additional information was obtained by me from selected fish. Scale samples were collected from trout representing the principal size categories (the Fish and Wildlife Service also took some scale samples). These samples will be examined later. The stomachs of several trout were examined cursorarily. Fish, large stone fly larvae, a beetle, and Diptera larvae were found. How much the sampling activities such as placement of the block nets dislodging aquatic larvae and the stocking of fingerling rainbow trout affected normal food habits is not known. Three of the larger brown trout were noted as containing well developed eggs (about 2mm in diameter and almost loose).

A serious problem occurred during the sampling at the Indian Meadows site. Apparently the rate of introduction of potassium permanganate was too low to neutralize all of the Pro Nox Fish and a substantial kill of fish occurred downstream from the site. Even though the introduction of the poison was stopped at 12:30 pm, I observed dead fish and fish in distress as far downstream as the gaging station pool at about 3:30 pm. At about 6:00 pm I inspected the pool immediately adjacent to the Kirkwood Power House and saw dead fish and fish in distress. The following morning, the 21st,

I saw two fish in the Early Intake pool that seemed to be in distress although I saw many other fish that appeared to be quite normal. Many of the fish that I saw dead were suckers and roach but, I suspect, the relative proportions of all species affected was approximately proportionate to their actual abundance. I have no idea of the extent of the kill except that I feel it must have been substantial. No decision had been made by the Fish and Wildlife Service and the Department of Fish and Game concerning any action to be taken although some consideration had been given to the possibility of restocking the area with rainbow and brown trout. None of the local people were notified of the occurrence.

The same procedures were used to sample the Gorge site except that no marked fish were stocked and the entire operation was completed within one day (also, a greater concentration of potassium permanganate was used). Personnel and equipment were flown to the site by helicopter from the Mather Ranger Station (some of the equipment was picked up from the Indian Meadows site). The block nets were set up and poison was introduced from about 10:40 am until 11:40 am. The potassium permanganate introduction seemed to have been much more effective (use of a greater concentration and a large, shallow pool below the site that provided a good mixing area probably helped) and only a few dead fish were observed immediately below (200 yards or so) the downstream block net. Dead fish were recovered from within the site as they were at the Indian Meadows site. Only trout were found:

Rainbow trout	176
Brown trout	117

This catch included more rainbow trout but possibly fewer brown trout than in 1970 (again, depending on the recovery rate that is used to adjust the estimate). However, the number of catchables appeared to be down (about 12 brown trout and about 6 rainbow trout). The Fish and Wildlife Service measured all fish and took some scale samples but I did not obtain any of these data at that time. The entire operation at the Gorge site was completed by about 1:30 pm.

I was unable to stay for the sampling at the two upstream sites. However, it was intended that the same procedures would be used.

The personnel involved in the work at the sampling sites included:

		Indian Meadows	Tuolumne Gorge
Jody Hoffman	FWS	X	X
Gwill Ging	FWS	X	X
Maury Fjelstad	CFG	X	X
Dick Daniel	CFG	X	X
Marty Allred	CFG	X	X
Baird Marshall	CFG	X	X
Kathy Lawhorne	CFG	X	X
Jim Horton	CFG	X	X
Mike Ross	FS	X	
Linda_____	FS	X	
Guenther Hines	FS	X	
Herb Sansum	NPS		X