XXII.—REPORT OF OPERATIONS AT THE UNITED STATES TROUT PONDS, M'CLOUD RIVER, CALIFORNIA, FOR THE SEASON OF 1881.

By LIVINGSTON STONE.

Hon. SPENCER F. BAIRD:

SIR: I beg leave to report as follows: At the date of my last report, December 31, 1880, everything at the trout-hatching station on the McCloud River appeared to predict an unusually prosperous season. No exertion had been spared to collect breeding fish for the ponds, and it is estimated that at the beginning of the year the ponds contained 3,000 very large breeding trout, none of which weighed less than a pound, while half of them weighed over five, and a few upwards of eight pounds. The average weight of the whole number was not less than three pounds. It was undoubtedly the finest collection of living trout in America, if not in the world. They would easily have yielded nearly a million eggs. But the bright promise of Christmas week was doomed to bring only disappointment and disaster. As I said, everything was favorable at that time. There had been no great rainfall up to the 1st of January, the trout were healthy and doing well, the water was good, the spawning time was close at hand, and the trout ponds seemed to be on the verge of a great success. But never were appearances more deceitful. In January it began to rain as it had never rained before in this region since white men came here. Four solid feet of water, lacking an inch, fell at Shasta City during this month, and here in the mountains the rainfall must have been much greater. The McCloud rose to an alarming height, but still no danger was apprehended at the trout ponds, because this station was built so far above the river, and no injury did come from the rise in the river. The mischief that was done proceeded from an entirely unexpected source, which well illustrates the fact that in a new country like this when trouble begins no one can tell what will come next.

The calamity that befell the trout, and it was a most serious one, was caused directly by *mud*, and only indirectly by water. The enormous volume of water poured down from the sky almost literally liquified the soil on the hill-sides, so that it actually flowed down into the valleys below. In some instances on a steep hill-side a whole acre of soil to an

unknown depth, completely saturated with water, would in this way flow down into the gulch beneath.*

The effect on the creeks into which this enormous mass of earth descends is indescribable.

The first result is that the creek is completely dammed up by the avalanche. Now, if this were a dam of dry earth the creek would rise till it overflowed the crest of the dam, and then, cutting a channel over the top, it would finally wear a gap down through the dam to its own natural level. But in this case, instead of being dry earth, the dam is almost mud, and the water above it as it rises pushes this saturated mass before it instead of waiting to rise up over it, and mingles with it, the whole commingled mass then flowing down through the cañon to the river below.

What has just been described as happening to creeks generally when land-slides occur from an excessive rainfall is what actually occurred in the stream on which the United States trout ponds are built. The consequences to the ponds were terrible. The trout-pond station was built so far above the McCloud that the river could not reach it. It was also so guarded from high water in the creek that the floods could not reach it in that direction. But for this invasion of mud no provision had been made. It had not even been dreamed of, nor did the possibility of its occurring ever enter any one's mind until it came.

As the mass of mud rolled down the creek towards the ponds nothing could be done but to let it come into the ponds, because to shut off the mud would also shut off the water-supply from the trout, which would soon be fatal. On it came, increasing in volume till it began to fill the upper trout pond. In a very short time this pond was filled nearly to the top with mud, and then the men had to get into the pond and shovel out the mud. By the time this pond was excavated it was time

*These land-slides furnished a rude and rather novel method of determining what could be discovered in no other way, namely, the intervals at which great rains have fallen in past generations. It is as follows: The size of these land-avalanches corresponds very considerably with the amount of rainfall at the time the slide occurred. The greater the rainfall the larger the slides, so that when a very large slide is found we know that when the slide occurred there was a very large rainfall. Now, as vegetation begins very soon to cover a land-slide after it has subsided, it follows that the age of a slide occurring in past seasons can be approximated by ascertaining the age of the vegetable growth above it. For instance, if we find that a very large slide has occurred in some place we know that there must have been a very large rainfall the year that the slide moved, and if we find a tree a hundred years old growing on the slide we know that it must have been over a hundred years since the great rainfall came which made the slide.

A good illustration of this is furnished by the experience of Mr. J. B. Campbell, who found the remains of a very large land-slide on Town Creek, near Pittsburgh, about 10 miles from the fishery. The size of this slide indicated that when it occurred there must have been as great a flood as there was last winter. Now, there was a tree growing on this slide which on being felled was found to be two hundred years old. We know, therefore, that upwards of two hundred years ago there was a season when there was a very heavy rainfall.

to dig out the lower pond. No screens or nettings availed anything, for they became completely clogged up in a moment. This went on for eight nights and days, and so great was the accumulation of earth in the creek channel where the slide occurred that it was two weeks before the mud subsided so as not to require constant attention.

The direct mischief which it caused, of filling up the ponds, was bad enough, but the ulterior injury resulting from it was worse. This arose from the mud getting into the gills of the trout and producing an inflammation in them. Some were killed from it immediately, others survived for some weeks and even months, but succumbed at last. The total loss was very great, for when summer came there were not over a thousand fish left of the magnificent collection which the ponds contained in the fall. Those, however, which were left alive, on the 1st of June were all healthy, and no more deaths occurred after that time from inflamed gills.

During all this trying time of the floods, there were only four white men at the trout-pond station, and the labor and hardships entailed upon them were very great. These four men were Mr. Myron Green, Mr. Loren Green, Mr. Robert Radcliff, and Mr. George Hume. The energy and courage with which, for two weeks, in the solitude of these mountains and with the rain pouring down in more than torrents, they combatted with an enemy wholly unknown to them before, and which could neither be overcome nor successfully resisted, entitles them to a great deal of credit. They certainly showed no hesitation in encountering hardships and exposure which could not be expected of them for any mere pecuniary compensation.

By the end of the month of February the rainfall had very much decreased, and, though there were times when great vigilance and care were necessary, no serious trouble occurred after the 1st of March.

It so happened that the trout began to spawn just before the time of the highest water. The spawning season opened very auspiciously, and Mr. Myron Green, who had charge of the trout ponds, sent to the railroad station at Redding on the 26th of January 75,000 trout eggs for distribution at the East.*

At this time Pit River, 7 miles south of the trout ponds, was very high, though not quite impassable, and Mr. Green succeeded, at considerable risk, in getting the eggs across the Pit. By the time they reached the Little Sacramento at Reid's Ferry this river had become all but impassable, and no one could be found who was willing to venture to cross it. The eggs consequently lay there several days. In the meantime the floods had spread over the whole country, and the California Pacific Railroad for a hundred miles below Redding was more or less under water. The consequence was that the trout eggs spoiled in the crates long before they could be started on their eastern journey. I know

* These eggs were directed as follows: T. B. Ferguson, Baltimore, Md., 25,000; B. F. Shaw, Anamosa, Iowa, 25,000; N. K. Fairbanks, Geneva Lake, Wis., 25,000.

that some dissatisfaction was felt by the eastern consignees of these eggs, but if they could realize the difficulties which had to be encountered at the other end of the route in shipping the eggs they would not want to attach any blame to any one.

It was over three weeks before the waters had subsided sufficiently to allow the forwarding of any more trout eggs, and it was not till the 18th of February that Mr. Green succeeded in getting any through to Redding, Cal., which is the terminus of the California Pacific Railroad and the nearest railroad point to the McCloud River trout ponds. On the 18th of February 25,000 eggs were sent to Hon. B. B. Redding, secretary of the California Fish Commission at San Francisco. On the 19th 15,000 more were sent to Mr. Redding, and on the 23d of February 10,000 were forwarded to Mr. N. K. Fairbanks, of Chicago, Ill., and 10,000 to Mr. B. F. Shaw, of Anamosa, Iowa. From that time until May 1 Mr. Green continued at intervals to ship eggs to eastern points. There were still occasional washouts in various places on the overland roads, so that many of the eggs were sixteen or seventeen days making a journey of five, in consequence of which some lots were lost en route. On the other hand, where no delays occurred, the eggs went through in good order. There will be found appended to this report a memorandum of the distribution of trout eggs from this station.

There was one result of the land slides that made us a good deal of work, and this was that in many places portions of trails that we had built along the hill-sides slid away entirely, so that not a vestige of a path was left. This often happened where the slide itself was only a small one. There are fifteen miles of trails along the river that we keep in repair, and we had spent a good deal of time and labor upon them in order to facilitate the bringing in of the live trout that were caught for the ponds; and it was a work of no small magnitude to get these trails into good order again after the injuries caused by the rains.

When the rebuilding of the salmon fishery began, about the 1st of June, most of the trout-pond force came down to the salmon-hatching station to assist in the work there, only one or two men remaining at the trout ponds, and their time was chiefly occupied in taking care of the breeding trout, in capturing wild ones, and in making general repairs and improvements about the place. The condition of the trout continued to improve throughout the summer, and on the 1st of September they were all in splendid condition. I may add here that their food in winter is mostly beef, venison, and dried salmon. In summer it is chiefly boiled salmon, with beef and venison, often enough to keep them in good condition.

I mentioned in my report on the salmon-hatching station that during a short period in July and in August, a large number of salmon in the McCloud River died of a mysterious disease. A good deal of alarm was felt when it was reported one morning that the disease had extended to

the trout in the river, and that they also were dying like the salmon. The alarm was a very short-lived one, however, for the mortality among the trout only lasted a few days, and it was found upon investigation that only a very few trout died, and it is quite possible that these were made sick by feeding on the salmon that had died of the disease. No trout in the ponds were affected by the sickness at all, which showed at least that the cause of the mortality among the trout, whatever it was, did not extend up into the creeks.

After the season closed at the salmon-breeding station in October, the fishing for parent trout was vigorously prosecuted, and much hard work was done in repairing the trails and catching and bringing to the ponds live trout, which had to be carried in some instances several miles.

The winter's wood was also cut and brought in, and on the ditch which takes the water from the creek to the trout ponds a deep pond was sunk a short distance above the trout ponds, to catch the mud that is brought down by the water in the ditch.

No great rains fell during the fall up to the present writing (December 31). The river had not risen to any considerable extent except once, when it was 4 or 5 feet above the summer level. The breeding trout at present in the ponds are looking well, and unless there is an excessive rainfall like that of last winter there seems to be no reason why we should not take several hundred thousand eggs during the next spawning season, the beginning of which now appears to be close at hand.

Table showing the distribution of California trout (Salmo iridea) eggs from the McCloud River station in 1881.

1881.		
Jan.	26. T. B. Ferguson, Maryland	25,000
	26. B. F. Shaw, Iowa	25,000
	26. N. K. Fairbanks, Illinois	25,000
Feb.	18. B. B. Redding, California	25,000
	19. B. B. Redding, California	15,000
	25. N. K. Fairbanks, Illinois	10,000
	25. B. F. Shaw, Iowa	10,000
March	4. S. Webber, New Hampshire	4,000
	14. T. B. Ferguson, Maryland	700
	31. T. B. Ferguson, Maryland	10,000
April	7. T. B. Ferguson, Maryland	700
	16. J. G. Portman, Michigan	6,000
	16. R. O. Sweeney, Minnesota	8,000
	29. Philo Dunning, Wisconsin	5,000
	29. William Griffith, Kentucky	5,000
	29. J. P. Creveling, Pennsylvania	5,000
	29. Eugene G. Blackford, New York	500
	Total	179,900