

XIII.—REPORT OF OPERATIONS AT THE U. S. SALMON AND TROUT STATIONS ON THE M'CLOUD RIVER, CALIFORNIA, FOR THE YEARS 1885-'87.

BY LIVINGSTON STONE.

SALMON.

Matters in relation to salmon at this station remain in much the same condition as at the close of my last report. The property was left in charge of Mr. Robert Radcliff; but, for various reasons, no active operations were carried on during these years.

TROUT.

The operations in trout breeding at this station during the past two years developed no new items of special interest. The fishing in the McCloud River for breeders was continued very much the same as in previous years, and the station was conducted according to the same methods as heretofore.

A few improvements were made during the year, among which may be mentioned the building of two or three new boats, and the constructing of some ponds for growing the young trout, which ponds Mr. Loren W. Green, the superintendent of the station, says are so carefully and securely built that nothing can get into or out of them without his knowledge.

The date of the beginning of the spawning season for the trout in the ponds at this station has receded till now the first eggs are obtained late in December,* the first for this season being 12,500 eggs which were taken on December 26, 1885. Operations in taking eggs continued from this date until May 10, 1886, when the spawning season closed for that year. More than 220,000 eggs were obtained, as shown in Table I, accompanying this report, which were distributed as shown in Table II. In 1886-'87 over 268,000 eggs were taken, of which 184,300 were disposed of as per Table IV.

This total number of eggs taken in 1885-'86 was not so large as usual, owing chiefly to two misfortunes that befell the trout during the year. The first was another outbreak of the mysterious disease described in

* It used to begin in January.

my last report, and referred to more at length under the heading below, which carried off a great many of the breeding trout; and the second was a terrible rain-storm which visited the McCloud River in December, 1885, just before the trout began to spawn, and which forced so much mud and sand into the ponds that many fish died from the effects of earthy matter collecting in their gills. Specimens of trout that died of the disease and of some that died of earthy matter in their gills were sent to Prof. S. A. Forbes, of Illinois, for examination.

Some brief memoranda, which are given in Table VI from Mr. Green's diary, contain information in regard to the weather, the trout fishing, and other matters, from September 7, 1885, to December 31, 1886. Table V is also added, showing the temperatures of air and water at the station between the same dates.

DISEASE AFFECTING RAINBOW TROUT.—Mr. Green, superintendent of the trout ponds at the McCloud River station, described a disease which affected the rainbow trout in the ponds and river at this station during the fall of 1885, and caused the death of many breeding fish, substantially as follows: *

The fish all died in the same way, being apparently in perfect health up to the time of their being taken with this disease, while none that were taken ever recovered. By watching them closely, the first symptom discovered is that the fish begin to grow dark colored, some of them nearly black, and about the second day after this they refuse food and seem inclined to keep very quiet, and remain most of the time resting on their left sides at the bottom of the pond. This symptom differs from any I have ever witnessed in trout before. I have seen a great many fall sick and die, some from old age, others from bruises or fungus or other causes, but they almost invariably rise near the surface, and sometimes so near the top that their back fins will be out of water, and as they grow weaker they keep falling off towards the back screens; but such is not the case with any of these fish dying of this disease, as they lie on the bottom all day long unless disturbed, while if disturbed they swim off apparently all right. If taken from the water they seem to shake or quiver, and will splash around quite lively for a moment. They remain in this state from three to six days, breathing very naturally. I have kept them seven days after this, always lying on their sides and breathing faster each day. They seem to be in no pain, but simply stupefied. I think they would live even longer than this if it was not for the sediment that gathers in their gills from their being so quiet in the water. Some of them seem to cramp and their bodies will be crooked and it is almost impossible to straighten them. I have given them earth, salt, and everything I could think of as remedies, but to no avail. After they stop breathing it is eight or ten hours before they begin to get stiff or look like dead fish, and I have opened them forty-

* For previous references to this disease see F. C. Report for 1885, p. 134, and F. C. Bulletin for 1885, p. 472.

five minutes after there was no sign of breathing and no feeling, and still found the heart beating. The fish are all fat and nice to look at, and I can find no trouble with eyes or gills or any other part, except the stomach seems a little hard and drawn up, and a hard and contracted yellow substance sometimes appears around the heart and stomach.

The disease has been very severe in the McCloud River, and I feel sure that it was introduced into the ponds by transferring fish to them from the river. It seems to be a clearly contagious disease, as in one pond, which received no fish from the river and where the water flows directly to the pond from the flume without running over any other fish, no trout have been affected.

The water in the river this autumn has been much lower than I have ever known before, and has been of a milky, muddy color all summer, owing to the overflow from Ash Creek. The very hot weather melts the snow on Mount Shasta, which has been reduced much more than usual this summer and fall, some of which empties through this creek, and when very high the creek overflows its banks and carries quantities of ashes into the McCloud River.

The large trout suffered from this disease much more than the small ones. It was thought that the changed weather and heavy rains late in the fall would stop the progress of the disease, but it did not seem to do so. The temperature of the water while the fish were dying was about 58 or 60 degrees Fahrenheit.

Some specimens of these diseased trout were sent to Prof. S. A. Forbes, of Champaign, Ill., with the result of his making a careful examination and reporting as follows:

In these six specimens the kidneys were evidently the principal seat of disorder, the spleen being also considerably affected, and the liver much less so. The muscular tissue of the heart was involved in the single specimen that I examined in that particular.

The kidneys were as black as coal and as soft as mush, a condition explained by microscopic sections, which show the urinary tubules little altered, with their epithelial lining intact, but all the other tissues (the connective tissue, capillaries, &c.) almost wholly replaced by a mere pulp of pigmented corpuscles, black pigment granules, and micrococci, in which lie imbedded vast numbers of spherical corpuscles each containing an embryo parasite. These encysted parasites are so numerous that the kidney pulp is seen to be everywhere thickly speckled with them.

The spleen is much pigmented, like the kidneys, but less so, and the liver still less than the spleen, the pigment cells being much the most abundant about the blood-vessels, and often blocking the capillaries, especially in the liver, and causing the degeneration of large tracts of the gland substance. A similar disorganization of the liver cells frequently appears at a distance from arteries or veins. The

spleen and liver are free from parasites. On the other hand, my sections of the heart show great numbers of the kidney parasites all through the walls of that organ. I counted thirty-three in a single thin section. A hasty examination of the muscular tissue of the back showed none, and the brain does not contain them.

As matters are, I cannot doubt that these kidney parasites caused the death of these fish. In my previous and first examination of these fish I was misled by the fact that the first specimens from which sections were obtained contained relatively few of these parasites, while the general appearance of the organs in other respects was closely like that of the diseased herring from Lake Mendota.

Of course, no practical conclusion can be drawn from this until we know what these parasites are and where they came from, or in what other host they continue their development; and for this a general study of the subject on the spot would be necessary.

CHARLESTOWN, N. H., April 30, 1887.

TABLE I.—Record of trout eggs taken at McCloud River Station during the season of 1885-'86.

Date.	Females.	Eggs.	Date.	Females.	Eggs.
1885.			March 6.....	18	20, 200
December 26.....	12	12, 500	March 16.....	13	11, 500
1886.			April 3.....	10	10, 050
January 4.....	12	12, 200	April 5.....	10	20, 150
January 13.....	23	21, 000	April 12.....	4	5, 025
January 18.....	13	12, 100	April 20.....	8	10, 000
January 23.....	15	15, 300	April 27.....	10	10, 000
January 24.....	10	10, 100	May 5.....	12	13, 000
February 1.....	12	10, 150	May 10.....	10	8, 000
February 9.....	11	10, 050			
February 14.....	14	10, 100	Total.....	226	221, 425

TABLE II.—Record of trout eggs taken at McCloud River Station during the season of 1886-'87.

Date.	Females.	Eggs.	Date.	Females.	Eggs.
1886.			February 17.....	30	28, 000
December 26.....	8	7, 500	February 23.....	10	10, 000
1887.			February 25.....	12	10, 000
January 4.....	20	20, 500	March 3.....	21	20, 500
January 12.....	7	7, 200	March 9.....	5	5, 200
January 14.....	4	3, 000	March 20.....	21	20, 000
January 28.....	15	13, 000	March 29.....	10	12, 000
January 27.....	18	13, 200	April 5.....	10	10, 000
January 31.....	20	18, 000	April 8.....	28	24, 000
February 3.....	22	20, 300	April 11*.....	4	2, 000
February 12.....	15	11, 000			
February 15.....	12	13, 000	Total.....	200	268, 400

* At this date there are 53 more fish which are expected to spawn.

TABLE III.—Disposition of trout eggs from McCloud River Station during the season of 1886.

Date.	Disposition.	Number of eggs.
1886.		
Jan. 12	Central Station, Washington, D. C.	12,000
21	do	12,000
29	Lost by high and muddy water	20,000
Feb. 3	E. B. Hodge Plymouth, N. H.	12,000
9	H. M. Garlichs, Saint Joseph, Mo.	15,000
10	Hatched for trout ponds	10,000
17	H. M. Garlichs, Saint Joseph, Mo.	10,000
25	H. A. Cutting, Plymouth, N. H.	10,000
Mar. 2	B. E. B. Kennedy, Omaha, Nebr.	10,000
23	Otto Gramm, Laramie City, Wyo.	20,000
31	A. W. Aldrich, Anamosa, Iowa	10,000
Apr. 15	Lost by high and muddy water	20,000
18	H. M. Garlichs, Saint Joseph, Mo.	5,000
27	Hatched for river	
	Total	176,000

TABLE IV.—Disposition of trout eggs from McCloud River Station during the season of 1887.

Date.	Disposition.	Number of eggs.
1887.		
Jan. 14	Central Station, Washington, D. C.	5,000
19	E. D. Carlton, Spirit Lake, Iowa	20,000
29	B. E. B. Kennedy, Omaha, Nebr.	10,000
Feb. 12	R. O. Sweeney, Saint Paul, Minn.	25,000
17	H. M. Garlichs, Saint Joseph, Mo.	20,000
Mar. 9	F. N. Clark, Northville, Mich.	20,000
19	Central Station, Washington, D. C.	20,000
24	R. Kroeck, Denver, Colo.	5,000
Apr. 6	Central Station, Washington, D. C.	20,000
8	Hatched and planted in McCloud River	17,000
11	do	22,300
	Total sent	184,300
	Lost from various causes	84,100
	Total eggs taken	268,400

TABLE V.—Temperatures of air and water at noon at McCloud River Station from September 7, 1885, to December 31, 1886.

Day of month.	1885.								1886.							
	Sept.		Oct.		Nov.		Dec.		Jan.		Feb.		March.		April.	
	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2			78	00	08	58	58	52	54	52	68	52	00	53	54	56
3			86	60	52	53	00	52	52	50	68	52	00	54	56	54
4			88	00	52	53	02	52	46	50	68	52	58	54	58	54
5			89	00	52	53	62	52	48	50	68	52	00	54	56	54
6			87	00	54	54	08	52	46	50	62	53	00	54	56	54
7			86	00	50	50	00	52	48	48	64	53	00	54	56	54
8	78	00	86	58	50	50	56	52	40	48	62	54	00	54	00	54
9	70	60	85	58	52	50	54	52	48	48	60	54	00	54	58	54
10	78	00	84	58	46	48	54	52	48	48	66	54	00	55	60	54
11	80	00	83	58	48	48	58	52	46	48	66	54	00	54	60	54
12	80	00	82	58	48	48	56	52	50	48	60	54	00	56	60	64
13	84	00	81	58	48	48	60	52	56	48	66	54	48	56	58	54
14	80	00	80	56	46	48	60	52	60	60	60	54	50	54	58	54
	82	00	80	56	48	48	00	52	50	50	68	54	48	54	58	54

TABLE V.—Temperatures of air and water at noon at McCloud River Station, etc.—Cont'd.

Day of month.	1885.								1886.							
	Sept.		Oct.		Nov.		Dec.		Jan.		Feb.		March.		April.	
	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.
15.....	80	60	79	56	44	46	56	62	56	50	72	54	48	54	59	54
16.....	86	60	78	58	42	46	50	52	44	48	72	54	48	54	60	60
17.....	88	60	78	56	44	44	50	52	46	48	74	54	49	54	60	60
18.....	88	60	80	56	50	46	60	52	38	48	74	54	50	54	64	64
19.....	84	60	58	56	50	46	58	52	48	50	72	53	56	54	66	66
20.....	88	60	80	56	48	47	58	52	48	50	72	54	58	54	66	66
21.....	86	60	76	56	46	49	60	52	53	51	72	54	58	54	66	66
22.....	88	60	74	56	46	50	58	52	53	51	72	54	58	54	72	72
23.....	82	60	74	56	50	50	50	52	50	51	73	54	60	54	74	74
24.....	64	60	74	56	53	50	58	53	56	50	72	51	58	54	82	82
25.....	68	60	78	56	48	51	60	52	58	50	72	54	58	54	86	86
26.....	76	60	76	56	46	51	58	52	56	50	70	54	60	51	78	78
27.....	76	60	80	58	54	52	52	52	60	51	64	54	60	51	78	78
28.....	76	60	80	58	54	52	51	52	62	50	46	52	64	51	90	90
29.....	80	60	78	56	56	52	56	52	62	50	50	52	62	54	60	60
30.....	78	60	76	56	54	52	56	52	66	52	50	50	60	54	70	70
31.....	78	60	76	56	50	50	52	52	66	52	50	50	60	54	70	70

Day of month.	1886.															
	May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.	
	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.	Air.	Water.
1.....	74	56	100	60	98	60	100	60	78	58	60	56	48	50	44	48
2.....	73	57	102	60	96	60	110	60	84	58	70	56	48	50	44	48
3.....	73	57	98	60	98	60	110	62	84	58	66	55	49	50	46	48
4.....	68	58	98	60	96	60	98	60	86	58	60	55	50	50	50	49
5.....	68	57	96	60	94	60	98	60	80	58	64	55	46	49	52	49
6.....	69	57	98	60	93	60	102	60	84	58	66	55	44	49	52	49
7.....	56	57	98	60	92	60	98	60	78	58	64	54	44	49	48	48
8.....	56	56	96	60	94	60	94	60	78	58	60	54	50	49	40	48
9.....	56	58	98	60	98	60	90	59	70	58	62	54	48	49	50	49
10.....	64	58	90	60	100	60	88	59	98	59	60	54	46	49	52	49
11.....	64	58	80	60	102	60	90	59	102	60	58	54	49	49	50	49
12.....	68	58	80	60	104	61	98	59	100	60	58	54	44	46	48	48
13.....	70	59	88	60	108	62	100	60	91	59	56	53	46	48	48	48
14.....	76	59	82	60	108	62	100	60	94	59	56	53	40	48	46	48
15.....	82	59	84	60	110	62	96	60	96	59	58	53	42	48	44	48
16.....	92	59	86	60	104	61	98	60	98	59	56	53	38	48	46	48
17.....	90	59	80	60	100	60	80	60	88	58	50	52	42	48	48	48
18.....	92	59	88	60	98	60	88	59	86	58	58	52	42	48	50	48
19.....	92	59	90	60	102	60	90	50	84	58	62	52	50	49	52	48
20.....	94	60	98	60	104	61	92	59	80	58	62	52	38	48	52	48
21.....	92	59	106	61	98	60	90	59	78	58	60	52	40	48	54	49
22.....	90	59	98	60	96	60	88	59	82	58	58	52	42	48	56	50
23.....	90	59	92	60	102	60	84	58	88	58	60	52	40	48	56	50
24.....	92	59	90	60	98	60	80	58	80	58	59	52	44	48	58	52
25.....	94	50	86	60	96	60	82	58	84	58	60	52	42	48	60	52
26.....	90	59	90	60	90	59	84	58	80	58	60	52	44	48	58	52
27.....	92	59	92	60	98	60	78	58	80	58	56	51	42	48	50	51
28.....	94	59	88	60	98	60	80	58	72	57	54	50	40	48	52	51
29.....	92	59	92	60	100	60	86	58	70	57	52	50	48	48	54	51
30.....	98	60	94	60	96	60	84	58	68	56	52	50	40	48	54	51
31.....	102	60	90	60	94	60	86	58	58	50	50	50	40	48	52	51

TABLE VI.—Memoranda relating to the weather, etc., at McCloud River Station from September 7, 1885, to December 31, 1886.

Date.	Condition of weather, etc.	Date.	Condition of weather, etc.
1885.		1885.	
Sept. 7	Weather clear and moderate; caught 5 small trout; trout biting very poorly.	Oct. 26	Clear; caught 1 trout.
Sept. 8	Weather clear; water in river quite muddy; caught 7 small and 1 large trout.	Oct. 27	Four large and 2 small trout; some trout dying in river, but more in ponds.
Sept. 9	Weather very nice; 4 small trout.	Oct. 28	Clear; no trout.
Sept. 10	Clear and nice; 6 small trout.	Oct. 29	No trout; 5 dead ones in ponds; look fat.
Sept. 11	Weather same as usual; no trout.	Oct. 30	No trout; still looking badly in ponds.
Sept. 12	Clear and warm; no trout.	Oct. 31	Raining a little; no trout.
Sept. 13	Clear and nice; 1 small trout.	Nov. 1	Raining quite hard in afternoon.
Sept. 14	Weather very nice; no trout.	Nov. 2	Still raining slowly; no trout.
Sept. 15	Two very large trout and 2 small ones.	Nov. 3	Still raining; no trout; they bite very poorly.
Sept. 16	Three large trout and 7 small ones.	Nov. 4	Raining quite hard; water risen considerably.
Sept. 17	Weather nice; 1 large and 5 small trout.	Nov. 5	Heavy rain; water still rising.
Sept. 18	Weather nice; 1 large and 15 small trout.	Nov. 6	Raining very hard; water rising.
Sept. 19	Cool; 2 small trout, bait very scarce; very few salmon in river.	Nov. 7	Still raining quite hard.
Sept. 20	No trout; have sent to Sacramento for salmon eggs for trout bait.	Nov. 8	Raining; trout in ponds looking badly; 4 dead ones.
Sept. 21	Weather very nice; 7 trout.	Nov. 9	Raining not quite so hard.
Sept. 22	Weather nice, but rather warm; 1 large trout; some trout in river looking dull and sick.	Nov. 10	Clear; 3 more dead trout in ponds.
Sept. 23	Weather very nice; 2 large trout.	Nov. 11	Clear; no trout.
Sept. 24	Raining quite hard.	Nov. 12	Clear; more trout in ponds looking sick.
Sept. 25	Weather very nice; no more rain; no trout.	Nov. 13	No fishing yet, water too high; trout still dying.
Sept. 26	Two large trout, 9 small ones.	Nov. 14	Eight dead trout in ponds; no idea what ails them.
Sept. 27	Weather nice, but warm; 4 small trout.	Nov. 15	Raining all day; trout still look badly.
Sept. 28	Weather nice; 5 small trout, found 4 dead trout in river.	Nov. 16	Raining hard; water rising; 3 dead trout in ponds.
Sept. 29	No trout; several trout in river lying on their sides, but not dead.	Nov. 17	Raining hard; caught 2 large trout in fish-trap.
Sept. 30	Two large and 2 small trout; trout dying quite fast in river.	Nov. 18	Water rising fast; 1 trout in trap.
Oct. 1	No trout; trout still dying in river.	Nov. 19	Pleasant; no trout.
Oct. 2	Caught 3 small trout; 3 dead trout in river.	Nov. 20	Trout still dying in ponds; took out 8 to-day.
Oct. 3	Weather nice; no trout.	Nov. 21	Raining hard all day; water rising fast.
Oct. 4	No trout; more dead trout in river.	Nov. 22	Raining very hard; water high and still rising; took out of ponds 5 dead trout.
Oct. 5	No trout; trout in ponds acting very strangely.	Nov. 23	Water still rising; 15 feet high now; logs running over tops of traps; 3 dead trout in ponds.
Oct. 6	Weather very nice; 2 large trout and 4 small ones; some in ponds refusing food; some lying on their sides.	Nov. 24	Water very high and still rising; one boat swept away, and one trap washed out; water 20 feet high.
Oct. 7	Five large and 10 small trout; some in ponds still refusing food.	Nov. 25	Raining quite hard, but water falling some; snowing high up on mountains; 5 dead trout in ponds.
Oct. 8	Two large and 2 small trout.	Nov. 26	Raining slowly; water high; very dangerous crossing river; traps all filled up with sand and rocks.
Oct. 9	Weather cool; 2 large and 6 small trout; 3 that were lying on their sides are dead; a disease never known before seemingly nice, bright fish.	Nov. 27	Still raining; water high; 8 dead trout in ponds.
Oct. 10	Weather nice; caught 4 large trout.	Nov. 28	Raining slowly; water rising; snow melting on mountains.
Oct. 11	Two large and 5 small trout.	Nov. 29	Raining slowly; fish still dying; no apparent cause.
Oct. 12	Six large trout; more trout in ponds lying on their sides and refusing to eat.	Nov. 30	Raining a little; water falling; caught 2 trout in trap; took 13 dead trout out of ponds.
Oct. 13	Fifteen large trout; 5 trout dead in ponds.	Dec. 1	Clear; water rising; snow on mountains melting.
Oct. 14	Two large and 5 small trout.	Dec. 2	Clear; water falling.
Oct. 15	Have no bait; sent after some salmon eggs, but got none.	Dec. 3	Clear; water falling; 10 dead trout in ponds.
Oct. 16	Weather nice; no trout.	Dec. 4	Cloudy, but no rain; water falling; trout dying fast.
Oct. 17	No trout; some more trout in ponds lying on their sides, but not dead.	Dec. 5	Clear; water falling; 15 dead trout in ponds.
Oct. 18	Trout still lying on their sides.	Dec. 6	Morning foggy; no rain; fish still dying.
Oct. 19	Quite windy; 9 large and 3 small trout.	Dec. 7	Water low; 16 dead trout in ponds; all look fat.
Oct. 20	Clear; 7 large and one small trout; fish in ponds looking quite sickly.	Dec. 8	Cloudy; some fish in ponds looking sick.
Oct. 21	Seven large trout; 10 large trout in ponds died to-day; all look very fat and healthy.	Dec. 9	Cloudy, but no rain; shipped 4 specimens of diseased trout to Professor Forbes; took 18 dead trout from ponds.
Oct. 22	Clear; 7 large and one small trout.		
Oct. 23	No trout; those in ponds still looking badly.		
Oct. 24	No trout; trout in ponds refusing food.		
Oct. 25	No trout; they bite very badly; 3 dead trout in ponds; all look fat; no known cause for the disease.		

TABLE VI.—Memoranda relating to weather, etc.—Continued.

Date.	Condition of weather, etc.	Date.	Condition of weather, etc.
1885.		1885.	
Dec. 10.	Raining, but water falling; fish still dying.	Jan. 20	Raining hard; water high; no trout; lost 20,000 eggs.
Dec. 11	Clear; 13 dead trout in ponds.	Jan. 30	No rain, but cloudy; no mail; can not cross rivers.
Dec. 12	Clear; took 8 dead trout out of ponds.	Jan. 31	Clear; water falling a little; 1 dead trout in ponds.
Dec. 13	Clear; fish in ponds looking sick.	Feb. 1	Clear; water falling; caught 3 trout in trap; mail came to-day.
Dec. 14	Clear; some fish in ponds refusing food.	Feb. 2	Cloudy and misty; no hard rain; water falling.
Dec. 15	Raining hard all day; 20 dead trout in ponds.	Feb. 3	Clear, and water falling; trout in ponds looking much better, and eating well.
Dec. 16	Raining hard, water standing about the same.	Feb. 4	Clear; water getting quite low; caught in trap 5 female trout and 4 males.
Dec. 17	Raining; water 3 feet higher; 11 dead trout in ponds.	Feb. 5	Clear; water falling; no trout to-day.
Dec. 18	Clear; 5 dead trout in ponds.	Feb. 6	Clear; no trout; fish in ponds looking well.
Dec. 19	Clear; water low.	Feb. 7	Clear; water low; no fish running.
Dec. 20	Cloudy; water low; 8 dead trout in ponds.	Feb. 8	Clear; fish in ponds eating, and looking nicely.
Dec. 21	Raining all day; 6 dead trout in ponds.	Feb. 9	Cloudy, but no rain; eggs doing well.
Dec. 22	Raining all day; caught 10 large trout in trap.	Feb. 10	Clear.
Dec. 23	Raining hard; water rising fast; cannot cross river; caught 7 trout in trap; water in ponds muddy.	Feb. 11	Cloudy, and a little rain in morning; afternoon clear.
Dec. 24	Water 10 feet high, running over top of traps; raining hard; 14 dead trout in ponds; ponds very muddy.	Feb. 12	Clear; young trout hatched out and looking nicely.
Dec. 25	Raining very hard; water 15 feet high, but not rising any more; trout in ponds still dying.	Feb. 13	Clear; fish in ponds doing well, and young fish doing splendidly.
Dec. 26	Clear, and water falling; water very high in creek; can not get in traps; began to take eggs.	Feb. 14	Clear; water low; no fish.
Dec. 27	Clear; water falling fast; nights cool; eggs doing well; 8 dead trout in ponds.	Feb. 15	Clear; water low.
Dec. 28	Cloudy; more rain; water rising.	Feb. 16	Clear; eggs doing well.
Dec. 29	Raining; water high; eggs doing well.	Feb. 17	Clear; water very low.
Dec. 30	Clear; water falling; 3 dead trout in ponds.	Feb. 18	Clear.
Dec. 31	Clear; nights cool, eggs doing nicely.	Feb. 19	Clear; eggs doing well.
1886.		Feb. 20	Clear; water low.
Jan. 1	Clear; water falling.	Feb. 21	Clear; all the fish doing very well.
Jan. 2	Clear; 5 dead trout in ponds.	Feb. 22	Clear; eggs doing well.
Jan. 3	Clear; eggs doing well.	Feb. 23	Clear; water low.
Jan. 4	Clear.	Feb. 24	Clear; little fish looking very nicely.
Jan. 5	Clear; no trout running up traps.	Feb. 25	Clear; all the fish eating nicely.
Jan. 6	Clear; eggs doing well.	Feb. 26	Clear; water low.
Jan. 7	Clear; 4 dead trout in ponds.	Feb. 27	A little cloudy.
Jan. 8	Clear; disease seems to be leaving trout a little.	Feb. 28	Heavy snow-storm, very large flakes; raining at noon, mountains covered with snow; sun shining by spells in the afternoon.
Jan. 9	Clear; eggs doing nicely.	Mar. 1	Clear; water very low.
Jan. 10	Clear; fish seem to be looking a little better.	Mar. 2	Clear; fish doing splendidly.
Jan. 11	Clear; 3 dead trout in ponds.	Mar. 3	Cloudy, but no rain.
Jan. 12	Cloudy; eggs doing well.	Mar. 4	Raining slowly; eggs doing well.
Jan. 13	Raining a little; 1 dead trout in ponds.	Mar. 5	Raining slowly; fish doing nicely.
Jan. 14	Raining all day, but not hard.	Mar. 6	Still raining a little.
Jan. 15	Still raining.	Mar. 7	Raining a very little.
Jan. 16	Clear; eggs looking well.	Mar. 8	Clear; fish looking splendidly.
Jan. 17	Clear, though evening a little cloudy.	Mar. 9	Rather rainy.
Jan. 18	Snow-storm of about 2 inches.	Mar. 10	Clear.
Jan. 19	Raining hard all day.	Mar. 11	Clear; eggs doing well.
Jan. 20	Raining hard; water rising fast.	Mar. 12	Clear; all fish doing well.
Jan. 21	Clear; water falling.	Mar. 13	Clear.
Jan. 22	Raining very hard; water high; no trout running.	Mar. 14	Clear; little fish eating nicely.
Jan. 23	Raining hard; water rising fast; caught 8 trout in trap.	Mar. 15	Clear.
Jan. 24	Raining very hard; water high, and still rising.	Mar. 16	Cloudy, but very little rain.
Jan. 25	Clear in morning, sunshine at noon, and cloudy and raining in evening; water rising; caught 3 trout in trap; 2 dead trout in ponds; water muddy.	Mar. 17	Rather cloudy; eggs and fish doing well.
Jan. 26	Raining hard all day; caught 2 large trout in trap; water rising; expect to lose 20,000 eggs by high water.	Mar. 18	Cloudy; all fish looking well.
Jan. 27	Raining hard; water very high; water coming into hatching-house thick with mud.	Mar. 19	Cloudy; water low.
Jan.	Raining hard; water rising and muddy; no fish to-day.	Mar. 20	Clear.
		Mar. 21	Do.
		Mar. 22	Clear; a little wind.
		Mar. 23	Cloudy.
		Mar. 24	Clear; strong north wind.
		Mar. 25	Cloudy and windy; all fish looking well.
		Mar. 26	Clear; eggs doing well.
		Mar. 27	Clear.
		Mar. 28	Do.
		Mar. 29	Clear and very pleasant.
		Mar. 30	Clear.
		Mar. 31	Clear; all fish looking nicely.
		Apr. 1	Clear; little fish growing rapidly.
		Apr. 2	Clear; water low.
		Apr. 3	Clear.
		Apr. 4	Clear; water very low.

TABLE VI.—Memoranda relating to the weather, etc.—Continued.

Date.	Condition of weather, etc.	Date.	Condition of weather, etc.
1886.		1886.	
Apr. 5	Clear; eggs doing well.	Oct. 16	Clear; 15 large and 3 small trout.
Apr. 6	Clear; fish all eating well.	Oct. 17	Strong north wind; no trout.
Apr. 7	Began raining, very dismal day.	Oct. 18	North wind and very cloudy; no trout.
Apr. 8	Raining hard; river rising.	Oct. 19	Clear; no trout.
Apr. 9	Still raining quite hard.	Oct. 20	Do.
Apr. 10	Still raining; eggs doing well.	Oct. 21	Clear; no trout biting.
Apr. 11	Not raining quite so hard.	Oct. 22	Cloudy; no trout.
Apr. 12	Raining hard; water rising.	Oct. 23	Do.
Apr. 13	Still raining hard; water high and fast rising.	Oct. 24	Do.
Apr. 14	Still raining; water rising fast.	Oct. 25	Clear; no trout.
Apr. 15	Raining very hard; water higher than before this winter.	Oct. 26	Cloudy, without rain; no fish.
Apr. 16	Still raining a little; water high; snow on mountains.	Oct. 27	Cloudy; fish not biting.
Apr. 17	Not raining much; water still rising.	Oct. 28	Clear; no trout.
Apr. 18	No rain; water very high, but not rising.	Oct. 29	Do.
Apr. 19	No rain; water still pretty high.	Oct. 30	Do.
Apr. 20	No rain; water falling; little fish doing well.	Oct. 31	Do.
Apr. 21	Clear and nice; water falling fast.	Nov. 1	Clear; nights cool.
Apr. 22	Very nice; fish all doing well.	Nov. 2	Clear and pleasant.
Apr. 23	Splendid day; water quite low.	Nov. 3	Do.
Apr. 24	Very nice and warm; water low.	Nov. 4	Clear; trout not biting.
Apr. 25	Splendid weather; little fish growing rapidly.	Nov. 5	Do.
Apr. 26	Very nice; fish-traps all very badly damaged by recent high water.	Nov. 6	Do.
Apr. 27	Splendid weather; clearing out fish-traps.	Nov. 7	Do.
Sept. 6	Weather clear, with strong north wind; began fishing to-day; caught 1 large and 5 small trout.	Nov. 8	Very cloudy, with some rain; trout not biting.
Sept. 7	Continued north wind; almost impossible to stay on the water.	Nov. 9	Days clear and nights cool.
Sept. 8	North wind; no trout.	Nov. 10	Do.
Sept. 9	North wind; caught 6 small trout.	Nov. 11	Clear; no trout biting.
Sept. 10	North wind in forenoon; clear and still in afternoon; caught 5 small trout.	Nov. 12	Do.
Sept. 11	Hot and smoky, no wind; caught 4 small trout; large trout very scarce.	Nov. 13	Do.
Sept. 12	Hot and smoky; no trout.	Nov. 14	Cloudy, but no wind.
Sept. 13	Do.	Nov. 15	Cloudy, with wind.
Sept. 14	Clear; no trout.	Nov. 16	Cloudy, with strong north wind.
Sept. 15	Clear; caught 1 large trout; fishing very poor.	Nov. 17	Cloudy; no trout biting.
Sept. 16	Caught 3 small trout.	Nov. 18	Do.
Sept. 17	Clear; fishing poor.	Nov. 19	Cloudy; caught 13 trout.
Sept. 18	Clear; trout not biting.	Nov. 20	Heavy rain all night.
Sept. 19	Clear.	Nov. 21	Cloudy; night cool.
Sept. 20	Caught 18 nice trout.	Nov. 22	Cloudy, but no rain.
Sept. 21	Clear; no trout.	Nov. 23	Do.
Sept. 22	Clear; caught 7 small trout.	Nov. 24	Do.
Sept. 23	Clear; no trout.	Nov. 25	Clear and pleasant.
Sept. 24	Do.	Nov. 26	Do.
Sept. 25	Clear; 6 small trout.	Nov. 27	Cloudy; caught 13 trout.
Sept. 26	Clear; no trout.	Nov. 28	Cloudy; no trout.
Sept. 27	Clear; 5 small trout; few large ones in river.	Nov. 29	Cloudy; 13 trout.
Sept. 28	Clear; 6 small trout.	Nov. 30	Clear; 6 trout.
Sept. 29	Clear; water low; no trout.	Dec. 1	Cloudy; no trout.
Sept. 30	Strong north wind; no trout.	Dec. 2	Do.
Oct. 1	Do.	Dec. 3	Clear and pleasant; no trout.
Oct. 2	Clear; no fish.	Dec. 4	Do.
Oct. 3	Clear; 9 small trout.	Dec. 5	Do.
Oct. 4	Clear; no trout.	Dec. 6	Clear.
Oct. 5	Do.	Dec. 7	Do.
Oct. 6	Do.	Dec. 8	Clear, with north wind.
Oct. 7	Do.	Dec. 9	Do.
Oct. 8	Clear; 2 small trout.	Dec. 10	Cloudy, with south wind.
Oct. 9	No trout; moved boat up the river.	Dec. 11	Very cloudy.
Oct. 10	Clear; no trout.	Dec. 12	Do.
Oct. 11	Do.	Dec. 13	Do.
Oct. 12	Clear; 6 large trout and 12 small ones.	Dec. 14	Very cloudy, but no rain.
Oct. 13	Clear; no trout.	Dec. 15	Do.
Oct. 14	Cloudy; no trout.	Dec. 16	Raining slightly.
Oct. 15	Raining hard in evening.	Dec. 17	Cloudy, but not raining.
		Dec. 18	Clear and pleasant.
		Dec. 19	Cloudy, but no rain.
		Dec. 20	Cloudy; working on fish-traps.
		Dec. 21	South wind; working on fish-traps.
		Dec. 22	Began raining in afternoon.
		Dec. 23	Raining slowly; fishing in river all done; no trout in fish-traps as yet.
		Dec. 24	Water 3 feet higher than usual.
		Dec. 25	Raining slowly.
		Dec. 26	Raining again quite hard.
		Dec. 27	Raining very hard.
		Dec. 28	Water very muddy and rising.
		Dec. 29	Raining, but water falling.
		Dec. 30	Clear; water falling.
		Dec. 31	Rained hard all night.