United States Department of the Interior
NATIONAL PARK SERVICE
YELLOWSTONE NATIONAL PARK
WYOMING 82190

IN REPLY REFER TO:

June 20, 1980

Al Mebane, Chief Park Naturalist
Yellowstone National Park, Wyoming 82190

Dear Sir:

I have the pleasure to enclose typed copies of my early reports of thermal activity in the Park, covering the 1972, 1973 and 1974 seasons. Typed copies of my reports for 1975, 1976 and 1978 are already on file in the Park Library.

These reports are all of similar scope, organizing all the important field notes and observations into condensed descriptions for each month of the summer season.

Your obedient servant,

Sam Martinez

Sam Martinez, Volunteer in the Park

copy 4 of 15

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OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: August 19, 1972

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: June Report of Activity in the Upper Geyser Basin including the Midway and Lower Basins.

Geysers personally seen in action (including geyserous springs):

Old Faithful	White	Plate	one of the Trail Geysers *
Little Squirt	Silver	Little Cub	Anemones
Plume	Model	Aurum	Beehive
Beehive's Indicator	Depression	Dome	Lion
North Goggle	Beach	Sprinkler	Pump
Vault	Giantess	Sawmill	Infant
Solitary	Lone Star	Terra Cotta	Castle
Tilt	Tardy	West Triplet	Spasmodic
Penta	Churn	Turban	Deleted Teakettle
Bulger	Old Tardy	Pyramid	Rift
Oblong	Grand	South Grotto Fountain	
Rocket	Bijou	Flood	Vent
Comet	Grotto Fountain	Fountain	Grotto
Island	Cliff	Clepsydra	Riverside
Imperial	Jewel	Crack (LGB)	Bank
Twig	Kaleidoscope	White Dome	West Flood
Great Fountain	Jelly	Young Hopeful	Jet
Flame	Steady	Spanker	

Grand Geyser

Number of eruptions witnessed = 14, from the 10th to the 20th.

Number preceeded by Turban = 0

Bursts	1	2	3	4	5
Eruptions	0	4	8	1	1

Total = 14

In none of the eruptions was any delay caused by Rift or West Triplet observed. Turban followed Grand 1 to 2 minutes after the beginning of the eruption. On May 31 an eruption of Grand was preceeded by Turban but no details were reported.

Grand's first burst lasted from 6m25s to 12m15s, the average being 9m53s. The succeeding bursts were much shorter, ranging between 20 and 200 seconds, the average being about 55 seconds (excluding the extra long secondary burst of 200 seconds the average was 45 seconds). Vent consistently began after Grand and Turban by between 45 and 180 seconds, the average being 121 seconds. West Triplet was seen

* (Field work in 1973 showed this to be 'East' Trail Geyser.)

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playing before, during, and after eruptions of Grand. When it started before the eruption, no delay was perceptible, but the eruptions were of minor character lasting less than 8 minutes.

The duration of the entire eruption varied from 12 minutes 00 seconds to 18 minutes 15 seconds, the average being 13 minutes 58 seconds. The longest eruption also contained the most number of bursts, five, and the shortest first burst, 6 minutes 25 seconds.

Castle Geyser

Castle had a minor eruption on the 29th, lasting 3 minutes and delaying the major eruption about an hour and a half.

Fourteen major eruptions were witnessed personally, 13 with the customary steam phase and one short one without, the minor one mentioned above. One interval was seen on the 29th. A minor eruption occurred at 7:52pm and was followed after an hour and forty minutes by a major eruption.

Lion Geyser

Lion had four active phases from June 10 to the 30th. These occurred on the 11th and 12th, the 14th and 15th, the 20th, and the 25th and 26th. I witnessed nine eruptions and in every case the eruption was immediately preceeded by three roars, the last one leading into a spray of water. The majority of the eruptions lasted four minutes but one of five minutes and another of 1 minute were seen. The one minute eruption was preceeded by an eruption of North Goggle Geyser which was finishing just as Lion began. Lion and Little Cub were seen playing simultaneously twice this month, the only noticable effect being the diminished height of this type on the 10th. The duration was five minutes. Two eruptions of the North Goggle were seen by me in June. The first of these was 5 to 7 feet high and the second was 30 to 40 feet high.

Beehive Geyser

At the first of June Beehive was very frequent and predictable. The intervals were close to 7½ hours with occasional short ones approaching 5½ hours. After the eruption of Giantess on the 7th, the intervals were usually between 9 and 10 hours, but in the days following the eruption of Giantess the intervals became longer and more irregular. I know of one false indication of an eruption (Beehive's Indicator giving a solo eruption) which occurred on the 30th. Eleven eruptions were observed and each was very close to exactly five minutes in length.

Giantess Geyser

Giantess erupted on the 7th and disrupted Beehive's very regular activity.

Riverside Geyser

I observed 12 eruptions of this geyser. All but the one of the 24th followed the usual pattern. This particular eruption was preceeded by the small back indicator by exactly one minute. The large upper vent on top of the cone showed no activity other than steam until the moment of the eruption, when an explosive burst of steam blew out water in all directions from that orifice. Following that burst the column of water immediately shot forth from the crater into the eruption.

Vault Geyser

Vault had one active phase in June on the 30th. It erupted about every 55 to 65 minutes and lasted a few minutes. I observed four eruptions and timed one interval of 56 minutes.

Penta Geyser

I observed only one eruption of Penta on the 20th. It began at 9:12pm and lasted 43 minutes. I am positively sure that no eruption occurred during the remainder of June. The maximum height was 20 feet. Sawmill was quiet and Spasmodic was very low but boiling during the eruption.

Pyramid Geyser

I observed Pyramid Geyser in eruption from the boardwalk on two occasions near the beginning of June but in ignorance did not record its eruptions. A more complete record will accompany the July and August report.

Giant Geyser

During Grotto's quiet periods I would at times notice increased activity in this group. Bijou would play to a greater height, Mastiff and Catfish would splash frequently and Giant would boil up on the inside of the cone very violently and frequently. On one occasion Giant splashed a few feet over the top of the cone. There were, however, no eruptions of Giant this month.

Respectfully yours,

Sam Martinez

Sam Martinez, V.I.P.

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: August 22, 1972

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Report of Thermal Activity in Firehole Basins for July

Features seen in eruption:

Three Sisters North Vent	White Geyser	one of the Trail Geysers*
Round Geyser	Old Faithful	Giantess Geyser
Infant Geyser	Depression Geyser	Pump Geyser
Little Cub Geyser	Dome Geyser	Plume Geyser
Model Geyser	Aurum Geyser	North Goggle Geyser
Anemone Geysers	Beehive Geysers	Plate Geyser
Beach Spring	Solitary Geyser	Little Squirt
Beehive's Indicator	Vault Geyser	Lion Geyser
Grand Geyser	West Triplet Geyser	Turban Geyser
Vent Geyser	Rift Geyser	Castle Geyser
Terra Cotta Geyser	Spasmodic Geyser	Tilt Geyser
Spanker Geyser	Bulger Geyser	Tardy Geyser
Sawmill Geyser	Sprinkler Geyser	Old Tardy Geyser
Churn Geyser	Oblong Geyser	Spa Geyser
Grotto Fountain Geyser	Artemisia Geyser	Bijou Geyser
Pyramid Geyser	Atomizer Geyser	South Grotto Fountain Geyser
Rocket Geyser	Bank Geyser	Seismic Geyser
Grotto Geyser	Comet Geyser	Riverside Geyser
Pear Geyser	Jewel Geyser	West Round Spring
Island Geyser	Avoca Geyser	Spouter Geyser
Cliff Geyser	Narcissus Geyser	Clepsydra Geyser
Kaleidoscope Geyser	Great Fountain Geyser	Bead Geyser
Crack Geyser (LGB)	Young Hopeful Geyser	Fountain Geyser
A-2 Geyser	Steady Geyser	Twig Geyser
White Dome Geyser	Flame Pool	Flood Geyser
West Flood Geyser	Lone Star Geyser	

Grand Geyser

Number of observed eruptions - 28
Number preceeded by Turban - 7

Bursts	1	2	3	4	5
Eruptions	0	6	12	6	1

Total - 25

Number of eruptions preceeded by Turban vs. number of bursts

Bursts	1	2	3	4	5
Eruptions	0	0	7	0	0

* Field work in 1973 showed this to be 'East' Trail Geyser.

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	Max	Min	Average
Times of first burst	10 m 59 s	7 m	9 m 15 s
Times of successive bursts	3 m 50 s	25 s	1 m 1.13 s

Behavior of Grand showed little change during July. Waves on the surface of Grand preceeded the eruption by 1 to 2 minutes. In all cases where Turban preceeded Grand there were a total of three bursts. The interval before the eruption was completely independent of when Turban played before and leading into the eruption of Grand. On the 14th Rift started erupting during the pause between the 2nd and 3rd bursts. This was also an eruption preceeded by Turban. West Triplet and the unnamed geyser played before and during the eruption. Rift was also seen erupting on the 16th at about 4:00pm.

	Min.	Max.	Average (of 22 eruptions)
Total eruption time	10 m 46 s	16 m 55 s	13 m 6 s
Interval between bursts	3 s	75 s	47 s

Castle Geyser

Number of observed eruptions = 19
Number of minor eruptions = 1
Number of major eruptions = 17
Number of sloppy-phase eruptions = 2

The sloppy-stage eruptions occurred on the 23rd and the 27th. The eruption on the 27th was unusual in that it started with very tall bursts like a minor eruption at 1:48pm but lapsed into typical sloppy-stage activity lasting until the eruption which began at 3:45pm.

Riverside Geyser

Noted that overflow began 76 or 77 minutes before the eruption on three occasions.

Giant Geyser

Increased activity seemed less frequent this month. Water in Giant reached about halfway up the visible interior of the cone during the active periods and Catfish and Mastiff both splashed a foot above their orifice edges. Bijou always played higher during these periods. Bijou was in eruption most of the time but occasionally would stop eruption for a few hours.

Daisy Geyser

No eruptions of any of the springs in the Daisy Group are known to have occurred except for those of the Pyramid and Bank Geysers. Daisy and Splendid seemed very close to erupting at times but the constant overflow of Bonita Pool seemed to take just enough of the energy.

Splendid would sometimes burst 5 to 6 feet high but these bursts seemed to be the greatest power it was able to display. Pyramid Geyser erupted every 110 to 125 minutes giving displays up to 15 feet high three or four times per eruption with small steam phases after each one.

Atomizer Geyser

On the 16th I observed a preliminary eruption at 3:14pm and 14 minutes later at 3:28pm a major eruption. Before this the preliminaries have always preceeded the eruption by at least 1 hour and 45 minutes this year. The estimated height of the major eruption was 50 feet.

Round Spring Group

Pear Geyser was seen erupting approximately 10 feet high. The eruption was not recorded and no others were known to have occurred. West Round Spring periodically would ebb then have very heavy overflow and boiling followed by ebbing again, reducing the overflow until it stopped and then repeating the entire cycle again.

Myriad Group

Round Geyser was fairly frequent this month erupting at least once a day to a height of about 100 feet.

Lion Geyser

Lion had five active periods this month that I observed. They occurred on the 3rd, the 7th, the 13th and 14th, the 20th, and the 28th. A 35 minute interval occurred on the 28th between an eruption at 6:54pm and 7:29pm. The interval after the 35 minute one was one hour and twenty-three minutes.

Giantess Geyser

The eruption of Giantess on the 23rd through the 25th disrupted several springs on Geyser Hill. The eruption was a water phase type with no concluding steam phase. Aurum Geyser became noticably more frequent. Plume was erupting every 24 minutes for 3 days afterwards. Pools near the boardwalk at the Beehive Geyser filled to within an inch of the top. Scissors Spring would occasionally show why it is so named by overflowing for about 10 minutes. This occurred frequently on the 25th but slowly became less frequent later that week until stopping completely. Springs near Beach Spring ebbed several inches after Giantess finished erupting. Two days after Giantess began erupting her crater was once again overflowing.

Dome Geyser

This geyser showed evidence of more powerful eruptions than had been witnessed. It was seen to boil and overflow vigorously several times per hour a few days this month but the asphalt path showed evidence of a discharge great enough to spill over the top and run over the walk as well

as through the clay pipe under the trail. The height of the minor eruptions observed was at most 1 foot but the major ones must be of a much greater character than these.

Beehive Geyser

Beehive's interval increased steadily this month. The indicator gave false indications of an eruption of Beehive four times that I saw. These occurred on the 1st, 2nd, 10th and 11th. In each case Beehive would splash sometimes to 10 or 15 feet but after 30 to 50 minutes the indicator would stop and the splashing would subside for a few hours until the next eruption of the indicator which would then be followed by a normal eruption of Beehive.

Grotto Group

Spa Geyser: Spa had a major eruption on the 16th. Grotto was in eruption and as Spa filled it would occasionally burst a fountain of water 30 to 40 feet high. The eruption began at 5:02pm and lasted until 5:20pm when the water overflowed the crater and all splashing ceased.

Surprise and South Surprise

South Surprise Geyser and Surprise Geyser always erupted before the Grotto Geyser. Surprise Geyser usually led directly into the eruption of Grotto which began within 15 minutes of the start of Surprise Geyser and usually within 5 minutes.

Vault Geyser

Vault was in an active state on the 13th, the 18th and the 24th. The heights of the eruptions varied between 5 and 10 feet.

Respectfully submitted,

Sam Martinez

Sam Martinez, V.I.P.

OPTIONAL FORM NO. 10
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UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: September 29, 1972

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Report of thermal activity in the geyser basin of the Firehole River for August, 1972.

Features seen in eruption for the month:

Lone Star Group: Lone Star Geyser

Old Faithful Group: Old Faithful Geyser, Chinaman Spring

Myriad Group: Round Geyser
White Geyser
Three Sisters North Crater East Vent

Giantess Group:

Giantess	Anemone	Little Squirt	Plume
Beehive	Beehive's Indicator	Depression	Infant
Dome	Solitary	Aurum	Lion
Little Cub	Model	Vault	Plate
North Goggle			

Castle-Sawmill Group:

Penta	Spasmodic	Bulger	Old Tardy
Sawmill	Tardy	Churn	Spanker
Sprinkler	Terra Cotta	Deleted Teakettle	
Castle	Tilt		

Grand Group: Grand
Vent
West Triplet
Turban
Rift

Daisy Group:

Comet	Pyramid	Daisy	Splendid
Bonita	Brilliant	Radiator	Bank

Grotto Group: Grotto
Riverside
Grotto Fountain
South Grotto Fountain
Rocket

Giant Group: Bijou
Oblong

Cascade Group: Artemisia
Atomizer
Seismic
New Vent

Black Sand Basin: Cliff
Spouter

Biscuit Basin: Jewel
Avoca
Island
Cauliflower

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Midway Geyser Basin: West Flood

Lower Geyser Basin:

Great Fountain	Pink	Narcissus	Bead
Steady	A-2	White Dome	Young Hopeful
Clepsydra	Honeycomb	Fountain	Twig

GRAND GROUP

Grand Geyser

Subtle changes have occurred in this group this month. Grand has given two eruptions of one burst only. One of these occurred on the 5th and lasted 12 minutes 40 seconds. There were one or two periods in the eruption where Grand would quiet down but not stop, and then resume. East Triplet has developed a new vent on the southwest side and has increased its temperature from 80 to 168° F. Economic Geyser has periods of bubbling more often than it did in June and July. On the 6th Grand had a 12 hour interval due to an eruption of Rift.

Number of eruptions of Grand observed: 30
Number preceeded by Turban: 4 (All of these had a total of three bursts.)

Bursts	1	2	3	4	5
Eruptions	2	14	10	2	0

Total = 28

Length of the first burst: maximum = 12m40s
minimum = 8m08s
average = 9m58s

Length of the secondary bursts : maximum = 165s
minimum = 22s
average = 53s

Total eruption time : maximum = 14m43s
minimum = 10m05s
average = 12m34s

Length of the quiet period : maximum = 110s
minimum = 52s
average = 75s

CASTLE - SAWMILL GROUP

Castle Geyser: I observed two minor eruptions of Castle, one on the 26th

and the other on the 29th. In both cases after the eruption ceased, Castle would splash just as it does before an eruption but to a lesser degree, building until the major eruption took place about 4 hours later. No sloppy stage activity is known to have occurred during August. I observed a total of 19 eruptions.

Tilt Geyser

For four days, beginning early this month, the level of water in the vent beside Tilt was down 4 to 8 inches. During this period no eruption of Tilt is known to have occurred.

South Scalloped Spring

This spring seemed to become more active. Periodically the boiling would increase and a heavier overflow would send water cascading down the runoff channel paralleling the boardwalk. The temperature of this spring on the 29th was 202° F.

Churn Geyser

This geyser is usually very minor in character, but it gave a few major eruptions this month. Two of those which I observed reached a height of 10 feet in a manner not unlike a small Sawmill Geyser. These eruptions lasted a minute and thirty seconds and occurred on the 15th and 25th. After the eruption the water ebbed 4 to 5 inches.

GIANTESS GROUP

Sulfide Spring

Sulfide Spring ceased overflowing on the 6th but by the 7th the water had begun to trickle over the outflow channel again.

Beehive Geyser

The indicator proved to be most unreliable this month. I observed six false indications and was informed of several more this month. The indicator seemed to erupt about 8 hours after Beehive's last eruption and if Beehive didn't erupt it would wait several hours more before erupting again. It was not unusual to have two false indications between eruptions of Beehive but the shortness of observation periods prohibited the determination of more consecutive eruptions of the indicator without Beehive. The false indications I observed occurred on the 3rd, 12th, 13th (two), 17th, and 18th.

Lion Geyser

I observed Lion on the 1st, 8th and 9th, 13th, 19th, 22nd, and the 24th. The eruption phases seemed much shorter this month, usually lasting less than a day. A very short interval of 3 minutes between two one minute eruptions was seen on the 9th.

Vault Geyser

Vault was active on the 11th and the 22nd.

Dome Geyser

Dome was in an active phase several times this month. On the 13th I was fortunate enough to see the first eruption in the series, which sent water across the asphalt path (flowing) and reached a maximum height of about 5 feet. The first and most violent eruption of the series lasted nine minutes with eruptions of minor character following it every 7 minutes.

OLD FAITHFUL GROUP

Chinaman Spring

This spring was induced to eruption no less than three times this month. Soap was definitely the cause and the disturbance destroyed the algae and the clarity of the spring. Rocks, sticks, coins, and other debris were strewn across the boardwalk after the initial eruption. Eruptions are known to have taken place on the 16th, 18th, and the 26th. After each eruption water in the crater remained very low for several hours before slowly refilling.

GIANT GROUP

Giant Geyser

The activity has increased somewhat this month. Before Grotto's eruptions Giant would sometimes have periods of greater activity with steam rising from the tiny vents in front of the cone, and splashes to the upper portions of the cone from Giant itself. Mastiff splashed up to 3 feet high during these periods and Catfish also splashed up above its cone. Bijou played higher during these periods but also periodically rested.

Oblong Geyser

This geyser seems to be on a more stable pattern but intervals for it were not witnessed by me.

DAISY GROUP

Daisy and Splendid Geysers

These have also been the victims of soaping. The first series of eruptions occurred on the 11th. Splendid and Daisy erupted simultaneously twice (three hours apart). Daisy erupted almost hourly until early the next morning when Bonita Pool again refilled and overflowed. Evidence of soap was not found until the 13th when bubbles appeared in the small vents near Splendid. The activity was again witnessed on the 19th. This time bars of soap were found around the craters of several of the springs.

As to natural occurrences, Daisy and Splendid changed bery little. They had periods of increased activity but these were also shared by Bonita Pool. Bonita showed evidence that it has had more powerful eruptions this month. Fragmental sinter has been washed across the trail below Bank Geyser and the channel supplying this water leads directly to Bonita Pool. Normally this channel is completely dry.

Pyramid Geyser

This small geyser located on the flank of White Pyramid Throne had changed in character since July. The eruptions had been of several parts beginning with a period of overflow and splashing followed by an ebbing and second overflow leading to the major portion of the eruption. By August 4th these characteristics disappeared. The eruption begins with overflowing and splashing but for a longer period. This activity continues to increase in vigor until finally the major portion of the eruption initiates a steady column of water 10 to 15 feet high at an angle from the vertical of about 15 degrees for less than 30 seconds. This is followed by a steam phase and two or three more water and steam phase periods. The entire eruption lasts 30 to 45 minutes and the interval varies between 110 and 125 minutes. The height of the succeeding water phase decreases and at the end of the eruption the water drains from the chamber beneath the crater platform.

GROTTO GROUP

Grotto Geyser

This geyser was seen erupting much of the time. It was always preceeded by Grotto Fountain Geyser, usually by less than 5 minutes.

Riverside Geyser

The length of time of overflow was determined on three occasions: on the 6th, 76 minutes; the 10th, 81 minutes; the 21st, 90 minutes.

Rocket Geyser

I observed two major eruptions of Rocket Geyser, one on the 5th and the other on the 17th. The height was 30 to 40 feet in both eruptions.

CASCADE GROUP

Artemisia Geyser

One interval of 8 hours 31 minutes was determined on the 13th.

MYRIAD GROUP

Round Geyser

This geyser erupts about once a day at irregular intervals. One interval of 15 hours 58 minutes was determined between an eruption of the 24th and one on the 25th. The height varied from between 50 and 80 feet.

Three Sisters North Crater

The east vent in the north crater became active occasionally, erupting 5 to 10 feet high at 8 minute intervals for one or two days at a time.

- -

TEMPERATURE MEASUREMENTS - - - Taken on August 29, 1972

South Scalloped	202 ° F	
Scalloped	204 ° F	
East Triplet:	New Vent	Old Vent
quiet	140 ° F	128 ° F
bubbling	168 ° F	138 ° F

- -

CHANGES IN EAST TRIPLET GEYSER CRATER

By Sam Martinez, 8/29/72

Some time on the 27th or 28th of August East Triplet underwent a change. New vents appeared in the runoff channel between it and Grand Geyser and a very large collapse occured on the southwest end of the crater, opening a new vent. The increased temperature accompanying this killed the algae and created foam on the surface. Currents caused by the activity from the new vent have made ripples on the sediments around the crater and have washed some of this material into the old crater.

The behavior as well as the appearance have changed. Instead of quietly filling and draining as it had before, it now has periods of "eruption" where heavy discharge, bubbling, and spouting up to 6 inches high generate waves that etch the surrounding sediments. During this period two new fissures along the east and north sides issue water and bubbles in frying pan fashion, and a vent about 3 feet toward Grand's crater spouts 3 to 4 inches high. The old upper vent takes part during the activity by overflowing. It has removed about an inch of fragmented material from its orifice.

Before Grand's eruption the crater is no longer always filled. It seems to currently have a pattern all its own. On September 1st it was observed 2 feet below overflow and conditions indicated it had been there for some time. This condition changed very little until Grand's eruption, at which time the overflow filled the crater.

At the time the change occurred in East Triplet, a noticable decrease in activity of West Triplet was noticed. Before the new breakout, West Triplet would frequetly erupt 4 to 6 feet high around the eruption time of Grand. Now it infrequently overflows and bulges for less than 2 minutes showing a marked decrease in energy. The new activity at East Triplet may have taken energy from West Triplet and possibly Grand, causing it to come into its new existance.

Respectfully submitted,



Sam Martinez
1003 East 18th Street
Tulsa, Oklahoma 74120

REPORT OF THE ERUPTIONS OF CHINAMAN SPRING ON AUGUST 17 and 19, 1972

By Sam Martinez

On my way back from the eruption of Riverside Geyser as I reached the point on the asphalt trail near the sewage pump house, I observed an eruption of some spring near the river on the Old Faithful side. The height was approximately 20 feet and it appeared to be the Chinaman Spring. I quickly rished to the spot but the eruption was over before I got there. The time at which I first noticed the eruption was 10:52pm and the duration from that point was only forty seconds.

When I arrived at the scene I observed that it had indeed been the Chinaman Spring but no one appeared to be near the area. Rocks, cans, sticks and coins were strewn about the crater and on the boardwalk. The level of the water in the crater was down 7 to 8 feet below the surface, boiling and muddy gray. East Chinaman had ceased overflowing and had ebbed 3 to 4 inches. East Chinaman showed almost no boiling and the water was slightly murky, contrasted with its normal boiling, clear appearance.

Water from the eruption had splashed halfway across the boardwalk and rocks of several pounds weight had been lifted from the inside of the crater. The interior of the crater was slightly dirty, having a thin film of fine gray mud covering the inside. The upper 2 feet of the tube was black and fluted and opened out until it met a ledge at the 2 foot level. The ledge extended out from all sides and constricted the tube to a little less than the area at the top. On this ledge were coins, large rocks, a spike, a nail and several sticks. I managed to retrieve most of the items but could not improvise tools to get the coins and deep debris.

Approximately two feet below the first ledge was a second one. This one was much larger and had several rocks on it. One rock was particularly large and nearly the same size as the openings above it. Behind this rock against the side of the tube was a rusty "Wink" can. The opening in this ledge was about the same size as the one above it but at a different angle from the top. Below this opening about one foot was another ledge that seemed to be very small compared to the others. Below this last ledge was the level of the water after the eruption. The water was about 7 to 8 feet below the top of the cone when I arrived and rose to about 1 foot below the lowest ledge by midnight. The water appeared very muddy with suspended gray mud throughout. Boiling was constant and covered the visible surface.

About 3 to 4 feet from the cone on the southwest side I found a piece of soap that had evidently been thrown out of the tube. It was quite warm, very soft and wet, and appearred to be in the center of the runoff channel on that side.

I suspect that it was done by employees for the simple purpose of seeing

the Chinaman erupt.

By the next morning East Chinaman had resumed its normal behavior. Chinaman Spring had resumed overflow by late morning and stayed muddy.

The second and third ledges in Chinaman sound very much like the constriction mentioned by Bloss and Barth in "Observations on Some Yellowstone Geysers." They obtained a 2^{o} difference in temperature between the 1.38 and the 1.6 meter depth. These values closely agree with the estimates of depth I made for the ledges.

At present the Chinaman has not completely recovered its normal appearance. Today, three days after the apparent first soaping, there is evidence that repeated soapings in the past two nights has taken place. This morning I understand that Chinaman was empty and East Chinaman had ebbed a foot. This would seem to indicate that an eruption of Chinaman had taken place. I am told that physical evidence around the crater supports this conclusion. Last night while at Grand Geyser I did see many flashlights in the Chinaman area but by the time Grand had played and I had walked back the lights had gone. Unfortunately I did not stop by the Chinaman before or after I went to Grand.

In view of the present soaping activities and repeated offenses, I would venture to say it is probably the same person or group of persons each night and that something should definitely be done to stop it before a feature is destroyed or someone is injured. The debris from the first eruption clearly showed that large stones can be thrown across the boardwalk and seriously hurt anyone standing too near, not expecting a violent outburst.

Sam Martinez
8/20/72

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UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist

DATE: July, 1973

FROM : Sam Martinez, Volunteer in the Park

SUBJECT: Hot Spring Activity In the Geyser Basins of the Firehole River for June 1973

Geyser activity was observed in the following hot springs during June:

LOWER GEYSER BASIN

Great Fountain Group

1. Great Fountain
2. Surprise Pool
3. A-2 Geyser
4. Botryoidal Pool

White Dome Group

1. White Dome Geyser
2. Crack Geyser
3. Narcissus Geyser
4. Pink Geyser
5. Pink Cone Geyser
6. Bead Geyser

Firehole Lake Area

1. Steady Geyser
2. Young Hopeful Geyser

Fountain Group

1. Clepsydra Geyser
2. Sub Geyser
3. Jelly Geyser
4. Twig Geyser
5. Jet Geyser
6. Spasm Geyser
7. Morning Geyser
8. Silex Spring

Hotel Group

1. Kidney Geyser
2. Thud Geyser

Kaleidoscope Group

1. Kaleidoscope Geyser
2. Deep Blue Geyser

Camp Group

1. Snort Geyser

River Group

1. Mound Geyser

Imperial Group

1. Imperial Geyser
2. Spray Geyser

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MIDWAY GEYSER BASIN

1. Flood Geyser
2. Till Geyser
3. West Flood Geyser

UPPER GEYSER BASIN

Biscuit Basin

1. Island Geyser
2. Jewel Geyser
3. Avoca Geyser
4. Shell Geyser
5. West Mustard Spring

Cascade Group

1. Artemisia Geyser
2. Seismic's New Vent
3. Atomizer Geyser

Morning Glory Group

1. Spiteful Geyser
2. Mortar Geyser
3. Fan Geyser

Grotto Group

1. Grotto Geyser
2. Grotto Fountain G.
3. Riverside Geyser
4. Rocket Geyser
5. Spa Geyser
6. South Grotto Fountain G.

Giant Group

1. Bijou Geyser
2. Oblong Geyser

Round Spring Group

1. two unnamed Geysers

Grand Group

1. Grand Geyser
2. Turban Geyser
3. Rift Geyser
4. West Triplet Geyser
5. Vent Geyser

Castle-Sawmill Group

1. Castle Geyser
2. Spasmodic Geyser
3. Spanker Geyser
4. Tardy Geyser
5. Sawmill Geyser
6. Bulger Geyser
7. Deleted Teakettle
8. Sprinkler Geyser
9. Terra Cotta Geyser
10. Chimney Cone
11. Old Tardy Geyser
12. Churn Geyser

Black Sand Basin

1. Spouter Geyser
2. Cliff Geyser
3. Rainbow Pool

Daisy Group

1. Daisy Geyser
2. Splendid Geyser
3. Bank Geyser
4. Comet Geyser
5. Pyramid Geyser

Myriad Group

1. White Geyser	2. Round Geyser	3. Three Sisters North Crater

Giantess Group

1. Little Squirt	2. Little Cub Geyser	3. Vault Geyser
4. Anemone Geysers	5. Lion Geyser	6. Giantess Geyser
7. Roof Geyser	8. Goggles Springs	9. Infant Geyser
10. Model Geyser	11. Plume Geyser	12. North Goggle Geyser
13. Beehive Geyser	14. Beehive's Indicator	15. Depression Geyser
16. Plate Geyser	17. Pump Geyser	18. Beach Geyser
19. Aurum Geyser	20. Solitary Geyser	21. Dome Geyser

Old Faithful Group

1. Old Faithful Geyser	2. Chinaman Spring

LOWER GEYSER BASIN

Fountain Group: Some time during the winter the geysers in this group suffered a severe shift in thermal energy from Fountain to Morning, resulting in a dormancy of Fountain and eruptive activity in Morning. This condition was further demonstrated by the water level in both craters. During the quiet phase water in Fountain would be about a foot or two below the sinter channel between the two craters, and quite often water would be overflowing from Morning into Fountain.

Other Geysers in the complex have shown an increase in activity from last year. These included Jet, Spasm and Silex. On one occasion I observed Silex about 2 feet below overflow. When the crater filled and began to overflow the boiling increased and reached more than a foot high, continuing for several minutes. Jet is more frequent in its eruptions while all Spasm does the majority of the time is overflow and boil.

MIDWAY GEYSER BASIN

Geyser activity in this basin appeared much the same as last year with little or no change in character. Geysers seen in eruption included Flood, West Flood, Till, and Catfish (New).

UPPER GEYSER BASIN

Biscuit Basin

Avoca Geyser was observed to have major eruptions several times per hour with the entire fissure active and erupting water 10 to 15 feet high.

Shell Geyser was also more active, being in eruption most of the time with the height being only a few feet .

The two unnamed geysers near Cauliflower were again very active this year during June.

Cascade Group

Seismic Geyser: Activity of the 1971 vent has evidently brought about dormancy of the main vent. Eruptions of the vent are very long and occur several times a day. The height is rarely over 5 feet and maximum height is usually reached about halfway through the eruption. Most of the water discharges directly into the main crater, into which this new vent is steadily eroding. During the past winter some of the fumarolic sinks in the area became more active and water can be seen in their vents.

Artemisia Geyser: Few eruptions of this geyser were witnessed this month, but the behavior of this feature is essentially the same as last year.

Atomizer Geyser: There is certain evidence to indicate that this geyser has more frequent major eruptions than last year. The interval between minor eruptions is about one hour and 45 minutes, the height of minor play being 15 to 20 feet.

Morning Glory Group

Morning Glory Pool: The pool has changed little since last August, the lessened visitation cutting down on the tremendous vandalism observed in past seasons. The color of the pool has changed slightly, indicating hotter temperatures in the upper part of the crater. The overflow from the pool goes toward the east and north, emptying into the large crater north of Morning Glory where a shallow pool of water can be seen in the bottom.

The two Sentinel Geysers were in a constant state of boiling all month with no major eruptions observed.

Fan, Mortar, and Spiteful Geysers: These three geysers as well as some nearby springs seem to be closely connected. Some time during the winter Fan and Mortar became dormant and the nearby Spiteful Geyser began having eruptions of spectacular character. The maximum height of the eruption is reached in the first minute of play and averaged between 25 and 30 feet. About a minute after Spiteful initiated activity, Mortar's lower vent would quickly fill and erupt 10 to 15 feet high. Both geysers would play for about 5 minutes, Spiteful ceasing first with great suddenness. During some eruptions the lower vent of Mortar would be inactive or pause soon after it began and continue or restart sometime later. When this occurred the eruption of Spiteful also became less vigorous and would usually drop below 10 feet in height.

Few intervals were determined for Spiteful but during early June they varied between 5½ and 7 hours. As the month progressed, the intervals grew longer and more irregular. The intervals before an eruption not

preceeded by the steam vent were shorter by 1 to 2 hours.

Two types of preeruption activity were observed in early June. The first was characterised by slow filling of the crater with some boiling in the pool and steam emitted from the crack on the southeast side. When the pool overflowed, steam from the vent was very noisy and an eruption usually followed in 2½ hours. The second type occurred always after an eruption of the first type and was characterised by more rapid filling of the crater and periodic bursts as the crater filled. These bursts sometimes reached 10 feet above the upper platform of the deposit and lasted several seconds. However, the eruption would only take place after the geyser had reached overflow and usually had been doing so for 20 to 30 minutes. As the crater filled, the bursts grew smaller and less frequent until one large burst triggers the main activity. With this second type the steam vent on the southeast side is completely quiet until after the eruption has begun. Mortar's low vent behave's exactly the same way as in the first type.

Before Spiteful erupts the spring directly across the trail will fill up to the top of the fallen tree and drain after the eruption. The steam vents around the spring become very active after the pool drains a foot or so and the volume of steam discharged is quite noticably greater.

The last eruption of the second type that I witnessed was on the 13th and since that time the overflow period before eruption has increased to several hours. If this continues, there is a good chance conditions will return to what they were last summer with Fan and Mortar active and Spiteful again dormant.

The average duration of Mortar was four minutes with a maximum of 5m40s and a minuimum of 2m00s. The average duration of Spiteful was 4½ minutes with a maximum of 5m30s and a minimum of 2m15s.

Grotto Group

Grotto and Rocket Geysers: The total activity of these is about the same as it was last August. Grotto erupted about half the time and Rocket seemed to be more frequent in its major eruptions.

Grotto Fountain Geyser: This geyser has not displayed the function it so faithfully performed last summer. Formerly it would always herald an eruption of Grotto. This season, frequently Grotto would begin without activity from Grotto Fountain. As the indicator spring filled South Grotto Fountain would erupt every 8 minutes, lasting 3 to 7 minutes and at a much greater height than last year, some bursts reaching 15 to 20 feet. At times the indicator spring would overflow for some time before Grotto began. When Grotto Fountain did erupt Grotto followed in about 2 to 5 minutes. The duration of Grotto Fountain varied between 16 and 30 minutes.

Chain Lakes: The only significant occurrence in this group of springs was the shift in overflow function to Link Geyser from the other springs in the chain sometime during the winter season.

Riverside Geyser: This geyser proved to be more frequent in June this year than in past seasons. Most intervals were less than 6 hours and usually close to 5h50m. The overflow usuallly started 1 to 1½ hours before the eruption, the average being 1h25m. The duration of five eruptions was taken and the total was found to vary between 22 and 25 minutes. The small vent near the bank that begins erupting a short time before Riverside showed a very wide variation in duration before Riverside did start. The minimum was 8 minutes and the maximum was 26 minutes. An average of the times of several observed eruptions was 16 minutes. (four)

Giant Group

Giant Geyser: Little change has taken place in several months. Giant would have periods of higher splashing usually around the beginning of Grotto's eruptions, but there was little indication that a new eruption cycle will be forthcoming. Bijou continued in its almost constant eruption and splashing is often seen in Catfish and Mastiff.

Oblong Geyser: This geyser seems to be making a come-back to a more frequent and regular pattern of play. One interval of 5h31m was determined on the 13th. The average duration of an eruption was 5m50s. The height was often 15 to 20 feet with occasional bursts near 30 feet. The intervals seemed to vary between 5½ and 8 hours, although few eruptions were reported this month.

Round Spring Group

This group has changed slightly over the winter with the shift of energy from some of the springs to two small geysers between North Round and Pear Spring. At times of activity, North Round will be very low and have bubbles rising through the throat. The more northern geyser is more active, but the southern one is larger. Eruptive energy shifts back and forth between the two for several hours before activity stops. The intervals for the northern vent are normally 2 to 8 minutes with the eruption lasting a minute or less and reaching a height of 2 to 5 feet. The southern vent is much less frequent but its eruptions are of a similar character and reach a height of 5 to 10 feet. I observed activity of these geysers on the 13th and the 27th. At the time of their activity the level of Pear Spring and Pear Geyser would rise a few inches.

West Round Spring: Overflow has continued without ceasing all month. The flow is nearly constant and not as heavy as some of the periods observed last season.

Daisy Group

Daisy and Splendid Geysers: One of the most welcome changes that occurred over the winter was the renewed activity of Daisy and Splendid. This month

proved to be the most active this year. Eruptions were seen every day from the 2nd to the 27th. After the eruption of Daisy at 8:05pm on the 27th the group went into a dormant period with Bonita overflowing heavily and splashing 1 to 3 feet high.

The activity has been somewhat different from that of the past. Splendid has shown great irregularity while Daisy was very predictable as long as Bonita Pool remained below overflow.

The behavior of Daisy and Splendid has been very complex due to the relationships between all the springs of this group. The cause of the present cycle of activity seems to be a general increase in energy of all the springs in the group, perhaps as a result of the repeated soapings of last year.

The intervals of Daisy varied between 1 and 2½ hours, depending mainly on Bonita Pool, the longest ones occurring when Bonita was overflowing. At times the overflow of Bonita Pool would cause a short, quiet period of a day to a day and a half. These were usually initiated by an active cycle of Splendid and were terminated by another active cycle of Splendid.

The first eruption of Splendid in a series usually also triggered an eruption of Daisy. Anyone fortunate enough to observe one of these dual eruptions was treated to one of the most impressive sights in the geyser basins. Splendid would surge up 10 to 20 feet then start climbing, rapidly reaching 130 to 160 feet. After about a minute of play, Daisy would suddenly jet 5 to 10 feet from its partially empty crater and rapidly go into full eruption with its column gracefully arching over the northern boardwalk. After about 3½ minutes Daisy would quit followed in a short while by Splendid.

The average of 20 durations of Daisy was 4m04s, the maximum being 5m30s and the minimum being 3m00s. The only good duration obtained for Splendid was 4m20s on the 26th. The recent activity has eroded the old drainage channels tremendously. It's not known how long they will continue to erupt but it is hoped that both will settle down to a regular pattern of play.

Pyramid Geyser: Behavior of this geyser has not changed much since it entered its present cycle of activity. Its isolated location away from the boardwalks and other features helps keep its behavior secret to all but a few who accidently notice it while waiting for Daisy or Splendid to erupt.

The interval is fairly constant, within 10 minutes of 1h45m. The total eruption time is over 30 minutes, during which there are several bursts or sub-eruptions, each followed by a steam phase. The water is jetted to a maximum height of 12 to 20 feet for 30 to 60 seconds when the water in the system becomes temporarily exhausted. The next sub-eruption usually follows in about 4½ minutes. The number of bursts varies from 2 to 6, each lasting 3 to 4 minutes and gradually decreasing in magnitude from the 1st to the last.

The water is erupted at an angle of about 30 degrees from the vertical to the north. In the deposit around the cone there are several tree branches that have been covered by beaded silica deposits, indicating that this type of activity has occurred in the past but interrupted by less active periods.

Black Sand Basin

No further activity in Rainbow Pool has been observed this month. The algae by the end of the month had started returning to the drainage channels, where the eruptions had scoured the sinter bare of vegetation.

Activity in Cliff Geyser seemed less frequent and very irregular. Not many eruptions were seen and usually the empty crater was the only indication that an eruption had taken place.

Opalescent Pool continued to lose its milky appearance this year. For several months the change has been particularly noticable.

Whistle Geyser Cone was observed overflowing for several minutes on a few occasions but no eruptions occurred. It has been dormant for many years.

Orange Spring Group

The two unnamed geysers near the road that were so active last year are dormant this month. It is not known exactly when they became dormant but it was sometime during the winter.

Myriad Group

Round Geyser: This geyser has shown great irregularity throughout June. I observed 15 eruptions, several from close range, all of which showed a great uniformity of character. The eruption was preceeded by three small, short bursts of boiling separated by pauses of a few seconds. The water was then suddenly rocketed into the air and quickly achieved maximum height, after which it soon exhausted its water supply. The water phase lasted 30 to 40 seconds and was followed by a steam phase of about 5 minutes.

On the 28th the flow of water in Abuse Spring and "Unexpected" Geyser (Spectacle Geyser) shifted. The water rather than flowing from Abuse into West Pool and across "Unexpected" now flows from "Unexpected" toward Round and into Abuse. The cause for the change in flow pattern is not known but certain evidence around Abuse Spring indicated that an eruption of Abuse probably took place over the winter which had shifted the flow to allow Abuse to overflow to the east. No definite evidence was found to prove that an eruption of any of the features on or near the 28th caused the shift this month.

White Geyser: This feature was active this month and erupted every 3 to 4 minutes to a height of 10 to 15 feet.

Three Sisters Springs: These springs were in overflow all month with the east vent in the north crater the only active geyser. It was seen erupting for a day or so each week, the interval being 5 to 9 minutes. The height of the bursts was 6 to 10 feet. Boiling was seen over the main vent in the north crater occasionally.

The springs in the field below the Inn, breaking out at the foot of

the slope, that were so active last summer until the last week in August, were still completely dry. Very little evidence remains to show that any activity occurred there at all.

Castle Group

With the disturbance in the early part of this year, Crested Pool became a very active spring. Around the time of Castle's eruption the periodic boiling in Crested becomes more violent. At times the western edge of the pool would surge up 3 to 6 feet high for 20 to 30 seconds. The wash around the crater indicated activity of a much greater magnitude has gone on unobserved on more than one occasion. The frequency of the bursts is irregular and there were no preliminary signs of activity.

Near-by Tilt Geyser was also affected by shifting energy. Its performance was uncertain and reached anywhere from 1 to 10 feet in height. The interval when active was about 30 minutes.

Castle Geyser: The activity of this geyser showed no change over the winter. Due to the dryness of the weather the eccentricities, which usually don't show up until later in the summer, began in late June with a sloppy stage eruption on the 29th. The splashing continued into the night after observations were concluded.

Sawmill Group

One of the many changes this month was an increase in activity of the many features in this group. Chimney Cone which had its vent clogged many years ago had reopened its main vent at the top and would occasionally splash water over the sides. No eruption was observed and it was nearly impossible to tell if one did take place. Several new vents have opened in the area near Chimney Cone. Most of these had ceased overflow and simply rose and fell with constant boiling as Chimney Cone became more active.

Deleted Teakettle: This geyser erupted several times per hour to a height of 1 to 2 feet.

Sawmill Geyser: The number of eruptions seen per day would indicate that this geyser had increased its activity over the winter. The observations I made on the 22nd showed that Sawmill was erupting about half the time. Tardy often erupted during Sawmill's eruption and usually gave a more powerful performance at those times, playing over 20 feet.

Another geyser slightly more active this year was Penta. It seemed to be very dependent on Spasmodic and would only erupt when Spasmodic was quiet and below overflow.

Belgian Pool: On the 21st there was evidence of a temperature increase in Belgian Pool. The water was slightly murky and the pulsations of the water had cut into the sides of the crater at a very low water level. The west vent, which had been almost completely clogged by debris, was deepened 2 to 3 inches and showed a larger opening underneath. After a few days the water cleared but the west vent was still slowly getting larger.

Eruptions of the small geyser between Tardy and Spasmodic were larger being 2 to 4 feet this month where last summer the maximum height was 1 foot.

Grand Group

Grand Geyser: The pattern of Grand was essentially the same as last year. The number of bursts varied from 1 to 5 with the total eruption lasting from an observed minimum of 10m20s to a maximum of 13m00s. The average eruption time of 20 observed eruptions was 12m16s. During the eruption the first burst was observed to vary from 6m48s to 11m23s with the average of 20 eruptions being 9m25s. The bursts following the first varied from 25s as the minimum to 3m02s as the maximum. The average of 30 secondary bursts was found to be 1m01.5s. The pauses between the bursts were usually very short compared to the time of eruption. The maximum time was 1m17s and the minimum was 23s. The average of 30 observed pauses was found to be 46s, only two being over 1 minute in length.

The distribution of the number of bursts during eruptions is shown in the table below:

Number of bursts	1	2	3	4	5
Number of eruptions	1	10	7	3	0

There was one eruption on the 23rd where Grand was observed to have only one burst, after which the crater drained and Turban and Vent continued into their afterplay activity, which lasted for quite some time afterwards.

The post eruption chain-action in the group followed the usual pattern of play; Turban,followed by Vent,then usually West Triplet, and occasionally Rift. Grand splashed 3 to 10 feet high from the vent frequently while the other geysers were erupting during the afterplay.

During the eruption when Turban followed Grand The average time between the start of Grand and the start of Turban was 1m01s. The maximum elapsed time was 1m30s and the minimum was 20s. When Turban immediately preceeded Grand the average time before Grand erupted was 26s. The maximum was 40s and the minimum was 10s.

When Turban preceeded Grand the number of bursts was always 3 or 4. Of the five eruptions where Turban was observed to start off activity, Grand had 3 of three bursts and 2 of four bursts. The 2 four burst eruptions followed an eruption of Rift which delayed Grand, giving the longest observed interval of Grand, 11h11m.

Vent immediately followed Grand at an average of 2m17s, the longest time interval being 2m45s and the shortest observed being 1m15s.

On the 11th Rift began erupting during the third burst of Grand's eruption and continued through the remainder of the eruption and several hours afterward.

Economic Geyser: At certain times in early June this geyser would overflow and bubble for several minutes. At other times, not directly related to this activity, East Economic would also overflow. This activity was a good indication that greater energy was being supplied to these geysers. The activity declined through the month and occurred only at long intervals by the 30th.

Geyser Hill or Giantess Group

A great majority of the springs in this group showed an increase in activity over the winter. Springs which showed increased overflow or boiling included the following: Sulfide, Little Squirt, Model, Teakettle, Arrowhead, Scissors, Beach, Pendant, Doublet, Pump, Goggles, and many unnamed pools or springs.

Plume Geyser: The new vent which broke out during the winter has caused plumbing changes which have also affected the character of Plume's eruptions. The steady rise of water typical of the indicator during past seasons has become jerky and very rapid during the final 30 seconds before the eruption, rising 3 or 4 inches to overflow during that short period.

The eruption begins explosively with simultaneous bursts from the upper and middle vents, both at times reaching 15 to 20 feet. The middle vent continues with a splashing type of eruption while the upper vent plays 10 to 20 feet continuously. The eruption will frequently decline in vigor and at time cease altogether only to resume with another large burst from both vents. The eruption is about half as long as it was last season but about the same amount of water is discharged. The runoff channels have shown a marked change in color to a lighter hue, showing an increase in the discharge rate. The indicator vent which also spouted during eruptions last year now only overflows during the eruption. Regretfully the sounds of draining characteristic of this vent for many years and appreciated by the naturalists has been eliminated completely due to the slowness of draining resulting from the new breakout. Fortunately for those who miss it they can still hear a close approximation by visiting the nearest comfort station.

Coincidental with the change in plumbing was a slight increase in irregularity over the long term as well as a small decrease in average interval which is now about 24 minutes.

Beehive Geyser: Beehive continued its frequent eruptive activity this year and has become one of the more regular major geysers in the basin. Thirteen eruptions were checked for duration and the average was found to be 5m50s. The maximum duration recorded was 7m04s and the minimum was 4m25s.

Beehive's Indicator during early June erupted 15 to 20 minutes before Beehive. As the month progressed it became longer until by the 26th it

had increased to almost 40 minutes. On the 28th Beehive's Indicator gave its first reported false indication of the year. The indicator erupted for 37½ minutes and quit with a very large splash from Beehive. The dryness of the winter and spring and the unusually early start of irregularities seem to indicate some effect of local rainfall and ground water levels on Beehive's activity.

The discharge from Plume, as was the case last year, appears to have a smothering effect on Beehive's Indicator. The cooler water running down from Plume over the vents of the Indicator at times seemed to cause it to quit prematurely, delaying Beehive for another Indicator cycle and disappointing those waiting to see Beehive. It has been observed to do this several times in succession but there is no real evidence that it is anything but coincidence other than the extraordinary number of times the Indicator has been observed to quit soon after the overflow from Plume passes over its vents.

Lion Geyser: Lion was observed on the 5th, 9th, 11th, 18th, 19th, 20th, 22nd, 26th, and 27th. Its activity in early June was quite different, with active periods of very short duration and at frequent intervals. As the month progressed the behavior reverted to that typically seen last year, active phases every few days lasting ½ to 1½ day.

Ten eruptions were checked for duration and the average was found to be 3m38s with the maximum being 4m15s and the minimum 1m20s.

Near-by North Goggle Geyser erupted occasionally during Lion's active phases, reaching 25 to 30 feet for a duration of about 6 minutes.

Giantess Geyser: No eruptions of Giantess took place during June but there was frequent activity of Vault and Dome.

Vault Geyser: Vault was active on the 22nd and 27th, erupting every 55 to 60 minutes for 3½ to 4¼ minutes. The surges reached between 5 and 15 feet high.

Dome Geyser: Dome was seen in eruption the 9th, 29th, and 30th. The initial eruption was the highest of the series and washed over the asphalt path. Those eruptions that followed were rarely over 2 feet and occurred about every 7 minutes for about a day.

Old Faithful Group

Chinaman Spring: Obvious signs indicated that an eruption of Chinaman occurred on the 15th. No further activity was indicated and ample evidence was found around the cone to indicate that it had been induced.

The small vent on the cone north of Old Faithful's mound was seen in eruption several times to about ½ to 1 foot high. No complete eruptions were observed and no known connection with Old Faithful was apparent.

Respectfully,

Sam Martinez

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: July , 1974

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Hot Spring Activity in the Firehole River Geyser Basins for June 1974.

Geyser activity was observed in the following springs:

LOWER GEYSER BASIN

1. Great Fountain Geyser	2. Crack Geyser	3. White Dome Geyser
4. Bead Geyser	5. Narcissus Geyser	6. Pink Cone Geyser
7. Steady Geyser	8. Young Hopeful Geyser	9. Clepsydra Geyser
10. Jelly Geyser	11. Jet Geyser	12. Red Spouter
13. Spasm Geyser	14. Sub Geyser	15. Twig Geyser
16. Deep Blue Geyser	17. Kaleidoscope Geyser	18. Angle Geyser
19. Sprinkler Geyser	20. Fortress Geyser	21. Mound Geyser
22. Imperial Geyser	23. Snort Geyser	24. Spray Geyser

MIDWAY GEYSER BASIN

1. Flood Geyser	2. Pebble Spring	3. Till Geyser
4. West Flood Geyser		

UPPER GEYSER BASIN

Biscuit Basin

1. Avoca Spring	2. Cauliflower Geyser	3. Island Geyser
4. Jewel Geyser	5. North Geyser	6. Rusty Geyser
7. Shell Geyser	8. three unnamed	

Cascade Group

1. Artemisia Geyser	2. Atomizer Geyser	3. Seismic's New Vent

Morning Glory Group

1. East Sentinel Geyser	2. Fan Geyser	3. Mortar Geyser

Chain Lake Group

1. Culvert Geyser

Grotto Group

1. Grotto Fountain Geyser	2. Grotto Geyser	3. Riverside Geyser
4. Rocket Geyser	5. South Grotto Fountain Geyser	
6. Spa Geyser		

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Giant Group

1. Bijou Geyser
2. Oblong Geyser

Daisy Group

1. Bank Geyser
2. Bonita Pool
3. Comet Geyser
4. Pyramid Geyser
5. one unnamed

Grand Group

1. Bulger Geyser
2. Castle Geyser
3. Crested Pool
4. Grand Geyser
5. Old Tardy Geyser
6. Penta Geyser
7. Rift Geyser
8. Sawmill Geyser
9. Spanker Geyser
10. Spasmodic Geyser
11. Sprinkler Geyser
12. Tardy Geyser
13. Teakettle Geyser
14. Terra Cotta Geyser
15. Turban Geyser
16. Vent Geyser
17. West Triplet Geyser
18. three unnamed

Geyser Hill or Giantess Group

1. Anemone Geysers
2. Aurum Geyser
3. Beach Spring
4. Beehive Geyser
5. Beehive's Indicator
6. Depression Geyser
7. Dome Geyser
8. Lion Geyser
9. Little Cub Geyser
10. Little Squirt Geyser
11. North Goggle Geyser
12. Plume Geyser
13. Pump Geyser
14. Scissors Spring (N)
15. Vault Geyser
16. Model Geyser
17. three unnamed

Myriad Group

1. Round Geyser
2. White Geyser
3. two unnamed

Black Sand Basin

1. Cliff Geyser
2. Spouter Geyser
3. Unnamed Geyser

Miscellaneous

1. Old Faithful Geyser
2. Lone Star Geyser
3. Lone Star's Satellite
4. Solitary Geyser

Lower Geyser Basin

Observation time in this area was limited to a few days, however, certain changes could easily be noticed:

1. The water phase of Red Spouter lasted well into the 2nd week of June.
2. Fountain and Morning Geysers remain completely dormant.
3. The other geysers of the complex seem to be enjoying an increase in available thermal energy. (Jet, Jelly, Spasm, etc.)

4. Due to the high water table level in the Fountain Group, the Fountain Paint Pot was active in a larger area of the crater.

5. Silex Spring was more erratic than usual in overflowing and occasionally erupted.

6. Overflow from the new feature near Jet Geyser was slightly greater but was entirely consumed by a crack near the boardwalk.

In general the activity of the area was somewhat diminished from what it was last year and even more from the 1972 summer. It remains to be seen whether the trend will continue.

Midway Geyser Basin

No unusual events have occurred in this area for some time. The activity of the springs near Rabbit Creek has shown a noticable decline since 1972 but very few changes since last August. Flood and West Flood continue to erupt with regularity on a pattern much as in 1973. Till Geyser continues to erupt about twice a day.

Upper Geyser Basin

The month of June saw many changes occur in the behavior of some of the smaller features. Some of the changes were short term but others have continued through the month, showing no signs of reverting.

Biscuit Basin

Contrary to many of the groups in the Upper Basin, this area seemed to enjoy an increase in thermal energy during June. Shell Geyser was seen in eruption most of the time and a small geyser south of Avoca was seen erupting at least twice a day to a height of about 4 to 8 feet.* A number of springs in the area near the Cascade Group showed increased activity and overflow, including Biscuit Basin Geyser which had periods of boiling every 5 to 10 minutes.

Three small unnamed geysers north of the Mustard Springs were seen erupting to heights varying from 1 to 7 feet. North Geyser was only mildly active this month, erupting to a height of only ½ to 1½ feet at intervals of uncertain and irregular length.

Cascade Group

The only significant fact observed for this group was one major

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* (This is the unnamed geyser near the boardwalk southwest of Silver Globe Spring which erupts from a crack along one edge of a circular basin. SM 5/80)

eruption interval of Atomizer which was found to be 14 3/4 hours.

Artemisia Geyser: An eruption of Artemisia on the 28th lasted 30 minutes, after which the water level receded to a level 3 feet below overflow.

Morning Glory Group

One of the most interesting developments this month was the return to activity of Fan and Mortar. Strangely enough Spiteful is still active but only to a limited extent. The eruptions of Spiteful are accompanied by eruptions from Mortar's low vent and, after the first of the series, start from a crater completely empty, in the same manner as Vault, Dome or Pyramid. The active cycle of Spiteful begins around the time of Fan and Mortar's major eruption, preceeding it by a few hours and continuing afterward for perhaps a few more hours. Because of the lack of observations, few eruptions of Fan and Mortar have been witnessed.

The large spring across the trail from Spiteful shows definite connection to it, because whenever Spiteful enters an active cycle that pool slowly begins to drain and remains empty until Spiteful once again fills to overflowing. A few of Fan's eruptions have not been accompanied by Spiteful's activity but the majority of them have.

The interval of Fan and Mortar has been quite variable. Markers placed on both have shown approximately when each eruption has taken place. The intervals for June were as follows: 7 days, 7 days, 8 days, 3¼ days, and 5 days. The initial eruptive phase was followed by two or more minor eruptive phases which became weaker until only gentle steaming issued from the cones. The water level was normal again after several hours and the occasional splashing from Fan's vents resumed soon afterward.

Grotto Group

Major eruptive activity of Rocket and Spa seem to be occuring more frequently this summer. The active cycle of Spa's eruption on the 27th lasting well beyond the time of overflow and due to other pressing matters I was forced to leave after it had continued for fully 90 minutes of activity.

Rocket's displays continued to be of about 5 minutes duration, the height being near 40 feet for the first 20 to 30 seconds and then rapidly dropping to 6 to 10 feet for the remainder of the eruption.

Daisy Group

Although when I arrived in the Park this year all members of the Daisy Group were in a state of great boiling, no eruptions of Daisy or Splendid have occured this month. Bonita Pool continued to erupt constantly 1 to 3 feet with heavy overflow, preventing any chance of Daisy's return to the active pattern of last summer. The increase of energy given the group last summer seems to have reshifted for the most part to Bonita Pool.

An unnamed spring west of Daisy's Thief near the edge of the group

which was 2 feet below the surface last year has become a boiler which splashes over the top of its cone from 2 to 3 inches below the surface deposits. Its temperature last year was only warm.

Bank Geyser continued its large eruptions on essentially the same pattern as last year.

Grand Group

Grand, Turban and Vent Geysers: Eruptions of Grand have been more consistent this month, with the majority of them being 3 bursts long. The following chart shows the distribution of the eruptions I observed:

TOTAL BURST DISTRIBUTION FOR GRAND

Number of Bursts	1	2	3	4	5	
Number of Eruptions	1	6	14	4	0	Total = 25
Percentage	4	24	56	16	0	

Often the third burst was seen to be the highest even when it happened to be the last. During the latter part of the month the intervals shortened noticably. It was at that time that the Triplets and Rift became very quiet. West Triplet was last seen erupting on the 25th and was seen after that time to overflow quietly for long periods before and after Grand's eruption.

Turban was seen to initiate activity only six times. The burst distribution of those eruptions is given below:

Burst Distribution of Grand for Turban Initiated Eruptions

Number of Bursts	1	2	3	4	5	
Number of Eruptions	0	1	4	1	0	Total = 6
Percentage	0	17	67	17	0	

This represents 24% of the total number of Grand's eruptions seen.

A number of eruptions of Grand were not followed by a lull in the activity of Turban and Vent. In most cases there would be a pause of some minutes before the afterplay began. The distribution of bursts of these eruptions is shown below:

Burst Distribution of Into Afterplay Eruptions of Grand

Number of Bursts	1	2	3	4	5	
Number of Eruptions	1	3	4	0	0	Total = 8 %age = 36
Percentage of totals	100	50	29	-	-	

A summary of the statistics for Grand and the other geysers is included at the end of this report.

Crystal Spring: Crystal began erupting on the 31st and continued to erupt at short intervals for a few hours before returning to its former state. A record of its eruptions follows this report.

A small frying pan near Old Tardy and Oval Spring was seen in action several times during the month.

Castle Group

Crested Pool continues to give large bursts at infrequent and irregular intervals from 3 to 10 feet high, a more frequent interval than last year.

Tilt Geyser is completely dormant and brown algae has lined its bowl and vent.

Teakettle Geyser erupts 2 to 4 times per hour to 1 foot high for 1 to 3 minutes.

Liberty Pool was in an overflow state the first week or two of June but dropped 3 inches below overflow sometime around the middle of the month with a noticable drop in temperature as well.

Geyser Hill or Giantess Group

The unnamed springs in the meadow across the road from the lower Hamilton Store at the base of the slope were active all through June.

Sulfide Springs were seen to bubble more vigorously and overflow more throughout the month.

A small geyser between Arrowhead and Depression was a perpetual geyser through most of June. It stopped erupting sometime late in the month.

A new small geyser has developed a short distance northwest of Plume.

Another new geyser has developed on the Hill in the new solfatara area of last year north of Ear and Pendant Springs.

Pump Geyser has changed colors again.

Myriad Group

A special effort was made to keep close track of Round Geyser and with great success. All the data was turned over to Geyser Specialist Rick Hutchinson, who has summarized all the observations from everyone

taking part in the effort. "Spectacle" Geyser, which merely overflowed last year, began erupting this winter to a height of 1 to 4 feet nearly constantly. There were eruptions of greater power which were seen in the first week of June which reached 10 to 12 feet, but they were seen from a good distance away and have not been seen since the first week.

White Geyser has shown less frequent eruptions and numerous pre-play splashing uncharacteristic of it based on last year's behavior. A small pool adjacent to the crater was seen erupting this month from ½ to 1 foot most of the time. The irregularity of White may be a result of this activity or the eruptions of Spectacle Geyser.

Round Geyser: The characteristic eruption pattern of Round was seen to change slightly. On infrequent occasions the preliminary, small, superheated bursts were entirely deleted as well as the indicator boil. These eruptions started with a massive overflow accompanied by a sudden rise in water level of about 2 to 3 inches. This was followed in a short time by the main burst. In addition to the main steam phase, secondary steam phases occured at increasing intervals after the main eruption. These were progressively shorter and included some water surges with spray as high as 4 to 6 feet above the cone.

The unnamed fissure pool west of Round was seen erupting frequently in a heavy boil 1 foot high.

A small geyser near the Carnegie Drill Hole cap was seen erupting 4 feet high for a few seconds on one occasion by myself and Marie Wolf.

This completes the notes for June. Attached are geyser statistics and records of eruptions for Crystal Spring. As an incidental note the small unnamed geyser near Lone Star was seen erupting on more than one occasion. I was unable to get data for it but some data was recorded at the Visitor Center.

Respectfully submitted,

Sam Martinez

GEYSER STATISTICS FOR JUNE 1974

Group	Spring	Data Explanation	Min. Value	Max. Value	Avg. Value	No. Data Pts.	Notes
UPPER GEYSER BASIN							
Lone Star	Lone Star G.	Dur.minor er.	---	---	3m55s	1	
Cascade	Artemisia G.	Duration	12m15s	30m00s	19m35s	3	
"	"	Interval	---	---	10h22m	1	
"	"	ov.after er.	---	---	4h35m	1	time of er. to ov.
"	"	heavy ov.B4 er.	---	---	1m35s	1	
"	Atomizer G.	Dur.minor er.	30s	63s	41.7s	3	
"	"	Dur.major er.	---	---	8m10s	1	
"	"	Dur.B4 2nd cone	---	---	2m40s	1	B4 2nd cone starts.
Morning Glory	Fan & Morter	Dur.main burst	13m00s	15m30s	14m15s	2	
" "	" "	major interval	3.25dy	8dy	6+dy	5	
	Spiteful G.	Duration	---	---	5m00s	1	Active w/Fan & (Mortar.
Biscuit	Cauliflower	Duration	---	---	2m35s	1	
Grotto	Grotto Ftn.	Dur.B4 Grotto	---	---	2m00s	1	
"	Riverside G.	Duration	---	---	26m00s	1	
"	"	Dur.Bank Ind.B4	---	---	35m17s	1	
"	"	Int.aft.upper V.	---	---	25m32s	1	
"	Rocket G.	Duration	---	---	5m00s	1	
"	Spa Geyser	Duration	---	---	90m +	1	
Giant	Oblong G.	Duration	5m35s	7m55s	6m38s	5	
Daisy	Pyramid G.	See attached notes for full eruption details.					
Grand	Bulger G.	Duration*	20s	6m30s	2m30s	3	*Cyclic in operation.
"	Grand Geyser	Total Duration	10m31s	14m57s	12m23s	22	
"	"	Dur.of 1st burst	7m03s	11m28s	9m27s	22	
"	"	Dur.other bursts	18s	3m30s	52s	39	
"	"	Dur. of pauses	26s	87s	47s	39	
"	"	Dur.waves B4 er.	25s	4m32s	2m20s	8	
"	Turban G.	Normal duration	3m20s	7m35s	5m12s	25	
"	"	Dur.with Grand	12m00s	16m10s	13m36s	9	
"	"	Normal interval	17m55s	24m10s	20m53s	13	
"	"	Dur.B4 Grand	17s	91s	60.1s	6	Turban initiated.
"	"	Int. aft.Grand	34s	105s	73.3s	11	Grand initiated.
"	"	Dur.aft.Grand qt	2s	3m00s	1m23s	12	After Grand quits.
"	Vent Geyser	Total duration	11m50s	16m10s	13m36s	11	
"	"	Dur.aft.Grand qt	1m20s	5m00s	2m26s	11	
"	"	Int.aft.Grand	1m11s	3m15s	2m22s	20	
"	West Triplet	Duration (normal)	---	---	25m40s	1	
"	" "	Int.aft.Grand	5m53s	9m40s	7m47s	2	
"	" "	Int.to Afterplay	2m30s	11m30s	5m21s	4	
"	Grand Complex	Afterplay Int.	9m10s	19m36s	14m39s	4	
"	" "	Afterplay Dur.	19m00s	90 +m	---	2	
Castle-Sawmill	Castle G.	Dur.of minor er.	2m55s	6m10s	4m42s	3	
" "	Old Tardy G.	Duration	20s	4m00s	1m34s	10	
" "	" "	Interval**	1m10s	10m20s	5m33s	7	**Cyclic.
" "	Penta Geyser	Duration	---	---	41m06s	1	
" "	Penta's 6th Vent	Duration¢	---	---	12m40s	1	¢Of its er., ½-2 ft.

Group	Spring	Data Explanation	Min. Value	Max. Value	Avg. Value	No. Data Pts.	Notes
UPPER GEYSER BASIN continued							
Castle-Sawmill	Sawmill G.	Duration	---	---	51m40s	1	
" "	Terra Cotta Geyser	Duration	---	---	2m00s	1	
		Interval	---	---	60m00s	1	
Geyser Hill	Beehive G.	Duration	4m57s	6m05s	5m31s	6	
" "	Beehive's Indicator	Duration	31m00s	78m00s	58m38s	4	
" "	" "	Dur.aft.Beehive	---	---	1m50s	1	After Beehive starts.
" "		Dur.B4 Beehive	19m50s	43m00s	31m25s	2	
" "	Depression	Duration	---	---	7m30s	1	
" "	Lion Geyser	Duration*	55s	7m40s	5m14s	9	*Four were 1st in (series, D = 7m+.
" "	Little Cub	Duration	---	---	30s	1	Unusually short.
" "	North Goggle	Duration	---	---	25s	1	Er. 5 feet high.
" "	Plate Geyser	Duration	---	---	7m00s	1	
" "	Plume Geyser	Duration	---	---	1m18s	1	
" "	Vault Geyser	Duration	3m00s	4m30s	3m45s	2	
Old Faithful	"Teapot"	Duration	30s	30s	30s	3	
Myriad	Round Geyser	1st boil at Ind.	21m57s	57m20s	43m51s	4	B4 eruption.
"	"	" " " " with ov.	3m30s	89m00s	33m38s	10	
"	"	Dur.1st burst	3s	33s	20s	12	
"	"	Dur.1st pause	1s	21s	5s	11	
"	"	Dur.2nd burst	2s	18s	6s	12	
"	"	Dur.2nd pause	1s	17s	4s	11	
"	"	Dur.3rd burst	2s	12s	4s	11	
"	"	Dur.3rd pause	1s	6s	3s	10	
"	"	Dur.main burst	30s	65s	47s	13	Water phase.
"	"	Dur.main steam	4m30s	5m57s	5m13s	14	Steam phase.
"	"	Dur.2nd steam ph.	3m30s	4m50s	4m14s	5	
"	"	Int.to 2nd steam¢	25m00s	32m00s	27m30s	3	¢From start of 1st (water phase.
"	"	Int to 3rd steam¢	55m	55m	55m	2	
"	"	Height 1st burst	3ft	6ft	4ft	5	
"	"	Height 2nd burst	2ft	8ft	5½ft	4	
"	"	Height 3rd burst	3ft	8ft	4ft	3	
"	"	Dur.heavy ov.	5s	30s	20s	4	B4 1st burst.
"	Spectacle G.	Dur.of er.@	3m35s	23m00s	12m19s	7	@All of these the 1 (to 2 foot kind.
"	UNNGN Carnegie Cap	Duration$	---	---	20s	1	$ 4 to 5 foot er.
"	White Geyser	Duration	20s	75s	39s	18	
"	"	Interval	3m05s	7m50s	5m18s	17	
LOWER GEYSER BASIN							
Fountain	Jet Geyser	Duration	37s	40s	38.5s	2	
Great Ftn.	Surprise Pool	Duration of er.	---	---	9m10s	1	
MIDWAY GEYSER BASIN							
Rabbit Cr.	Till Geyser	Duration	---	---	31m47s	1	
" "	"	Ov.B4 eruption	---	---	16m20s	1	

SPECIFIC GEYSER ERUPTIONS FOR JUNE OF COMPLEX GEYSERS

Pyramid Geyser

6/25/74	Overflow	21:20:15 - 21:27:15	
	Heavy boiling	21:21:30	½ to 1 foot.
	Overflow again	21:34:25	
	Heavy boiling	21:35:00	6 to 12 inches.
	Super boiling	21:36:50	1 to 6 feet.
	1st burst	21:39:35	12 feet.
	1st steam phase	21:40:30	
	2nd burst	21:44:50	
	2nd steam phase	21:45:30	
	Left area	21:46	

Belgian Pool and Crystal Spring

6/30/74	ie 16:12 - 16:14:30	
	16:16:15 - 16:17:10	2 feet high.
	16:19:00 - 16:19:50	
	16:21:30 - 16:22:05	
	16:24:00 - 16:24:35	Water level is staying higher longer.
	16:26:40 - 16:27:00	
	16:29:15 - 16:29:50	
	16:32:00 - 16:32:45	
	missed one.	
	16:37:10 - 16:38:10	A lot of heavy overflow.
	16:40:00 - ?	
	16:46:33 - 16:46:50	
	16:49:43 - 16:49:55	
	16:53:20 - 16:54:00	Only 5 inches high.
	16:55:55 - 16:56:00	
	16:59:00 - 16:59:40	This was the last of the series.

July, August, and Shoshone Reports for 1973 unavailable for transcription 5/25/80.

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UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: September , 1974

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Hot Spring Activity in the Firehole River Geyser Basins for July 1974.

Geyser activity was known to occur in the following springs:

LOWER GEYSER BASIN

Great Fountain Group

1. Great Fountain Geyser 2. Surprise Pool

White Creek Group

1. A-2 Geyser 2. Botryoidal Spring

White Dome Group

1. Crack Geyser 2. Pebble Geyser 3. White Dome Geyser

Pink Cone Group

1. Bead Geyser 2. Labial Geyser 3. Narcissus Geyser
4. Pink Cone Geyser 5. Pink Geyser

Firehole Lake Group

1. Steady Geyser 2. Young Hopeful Geyser

Fountain Group

1. Clepsydra Geyser 2. Jelly Geyser 3. Jet Geyser
4. Silex Spring 5. Spasm Geyser 6. Sub Geyser
7. Twig Geyser 8. two unnamed

Kaleidoscope Group

1. Deep Blue Geyser 2. Honeycomb Geyser 3. Honey's Vent Geyser
4. Kaleidoscope Geyser

Sprinkler Group

1. Sprinkler Geyser 2. Pithole Geyser 3. two unnamed

Hotel (Thud) Group

1. Kidney Spring

River Group

1. Fortress Geyser 2. Mound Geyser 3. one unnamed

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Quagmire Group

1. Snort Geyser

Fairy Creek Group

1. Imperial Geyser
2. Spray Geyser
3. two unnamed

MIDWAY GEYSER BASIN

1. Catfish Geyser
2. Flood Geyser
3. Till Geyser
4. West Flood Geyser
5. two unnamed

UPPER GEYSER BASIN

Biscuit Basin

1. Avoca Spring
2. Cauliflower Geyser
3. Island Geyser
4. Jewel Geyser
5. North Geyser
6. Rusty Geyser
7. Shell Geyser
8. five unnamed

Cascade Group

1. Artemisia Geyser
2. Atomizer Geyser
3. Bench Spring
4. "Little Seismic"
5. one unnamed

Morning Glory Group

1. Fan Geyser
2. Mortar Geyser
3. Spiteful Geyser

Chain Lakes Group

1. Culvert Geyser

Grotto Group

1. Grotto Fountain Geyser
2. Grotto Geyser
3. Riverside Geyser
4. Rocket Geyser
5. South Grotto Fountain Geyser
6. Spa Geyser

Giant Group

1. Bijou Geyser
2. Oblong Geyser

Daisy Group

1. Bank Geyser
2. Bonita Pool
3. Comet Geyser
4. Pyramid Geyser
5. two unnamed

Grand Group

1. Bulger Geyser
2. East Triplet Geyser
3. Grand Geyser
4. Lime Kiln
5. Old Tardy Geyser
6. Rift Geyser
7. Turban Geyser
8. Vent Geyser
9. West Triplet Geyser
10. two unnamed

Castle and Sawmill Groups

1. Castle Geyser	2. Churn Geyser	3. Crested Pool
4. Flume Spring	5. Oval Spring	6. Penta Geyser
7. Sawmill Geyser	8. "Sawmill's neighbor"	9. Spanker Geyser
10. Spasmodic Geyser	11. Sprinkler Geyser	12. Tardy Geyser
13. Teakettle Geyser	14. Terra Cotta Geyser	15. two unnamed

Orange Spring Group

1. two unnamed

Geyser Hill Group

1. Anemone Geysers	2. Aurum Geyser	3. Beach Spring
4. Beehive Geyser	5. Beehive's Indicator	6. Big Cub Geyser
7. Depression Geyser	8. Dome Geyser	9. Giantess Geyser
10. Infant Geyser	11. Lion Geyser	12. Little Cub Geyser
13. Little Squirt Geyser	14. Midget Geyser?	15. Model Geyser
16. Plate Geyser	17. Plume Geyser	18. Pump Geyser
19. Scissors Spring (NW)	20. Solitary Geyser	21. Vault Geyser
22. four unnamed		

Old Faithful Group

1. Old Faithful Geyser 2. one unnamed ("Teapot")

Myriad Group

1. Abuse Spring	2. Round Geyser	3. "Spectacle" Geyser
4. Three Sisters North Crater East Vent		5. White Geyser
6. two unnamed		

Black Sand Basin

1. Cliff Geyser 2. Spouter Geyser

Lone Star Group

1. Lone Star Geyser 2. one unnamed

LOWER GEYSER BASIN

A reconnaissance of the River Group springs was made on the 29th. In spite of the remote location of most of the springs, the amount of vandalism was surprising. Aparently the fishermen don't devote their full attention to fishing the Firehole River. A large stump was found in the Fortress Geyser but due to the lack of proper tools it was not removed. Logs were found in many of the springs. The majority of affected springs were on or near the edge of the river. The springs on the west side suffered the greatest amount of abuse. A crew of two or three would probably take the better part of a day cleaning out all of the springs that really need it.

In the Pocket Basin area the mud volcano or geyser at the end of the guided walk was tossing mud lumps 20 to 30 feet into the air. The vent showing this behavior is located at the end opposite the vent that demonstrated geyser action a few years ago.

Imperial Geyser: A visit to the Imperial-Spray area found very little difference in activity. The one significant observation was the near constant eruption of Imperial. Last year there were frequent pauses of about 18 seconds. The pauses are now few and far between, and are 25 seconds long (two recorded). Height is slightly greater than last year with frequent bursts near 65 feet.

Spray Geyser is essentially unchanged from last year.

UPPER GEYSER BASIN

Biscuit Basin

Shell Geyser has been seen in eruption each time it has been observed this month. Although there was no overflow the large bubbles rising through the half-filled basin threw the water up 1 to 3 feet high. It was not in constant eruption the entire month because early in the month it was reported as being empty and quiet.

Cauliflower Geyser: One eruption was observed on the 15th which lasted 1m38s. The eruption was preceeded by boiling which started 12m00s before the eruption. The water level was 4 inches below overflow when the boiling started and remained there until the initiation of the eruption.

The geyser 60 feet west of Cauliflower continues to erupt as described by Marler in the Inventory.

Cascade Group

Atomizer Geyser: Several eruptions were observed for the month. The pattern of the cycle was determined to be as follows:

1. End of the steam phase from a major eruption.
2. Dormant period of about 6 hours during which there is no overflow and no water visible but distant growling is heard far below for a few hours.
3. Water becomes visible in the main cone, slowly rising (a little over 6 hours after the last eruption or can be as long as 8 hours afterward).
4. The main crater enters a period of cyclic overflowings. The water rises from a point near the top of the throat. The basin slowly fills and

overflows. The overflow becomes very heavy, almost a flood. The water begins to pulse and rock in the crater. After 4½ minutes of this overflow the rocking suddenly diminishes and the overflow ceases. The water quickly retreats into the throat and just as quickly rises to the point near the top of it. The level again slowly rises to overflow and pulse as before. There are seven or eight of these cycles before the first minor eruption. These cycles alternate between 5 to 10 and 20 minutes, but close to the first minor eruption it has occasional, very heavy overflow and rocking periods which don't quite initiate an eruption but disipate enough energy to increase the interval of the next cycle to 25 to 30 minutes.

5. Four or five cycles before the first minor eruption, bubbles begin to appear just before the rocking starts. Two or three cycles before the first eruption the bubbles are interrupted by a splash or two. The cycle terminating in the first minor eruption is much the same as the two before it. The splashes were a little larger and there are more of them. They become more frequent toward the end of the 4½ minute overflow period. Just when you would expect the water level to drop, the center of the bowl explodes into a violent fountain, growing quickly to a maximum height of 15 to 25 feet. This first eruption lasts around 30 seconds but it can be as long as 1 minute. The water disappears down the geyser tube with lots of sputtering and growling.

6. The next eruption occurs in about 1½ to 1 3/4 hours. It is usually preceeded by only a few of the overflow cycles.

7. Minor eruptions following the first 2 to 4 are usually not preceeded by any overflow cycles. These typically overflow, splash, and go into eruption directly. The heights of these later minor eruptions are greater but the durations are all just less than a minute long.

8. The major eruption begins in exactly the same way a minor one does. The height of the water jet is about 25 to 35 feet. After a minute of eruption time has passed, instead of steadily declining the water column begins to become even more explosive. The fountain which up until this time has been projected through a filled basin blows out all the water in the bowl and becomes a

succession of rapid, twisting pulsations. The column fills less and less of the vent area, becoming rapidly alternating water and steam bursts. The second cone, which has been completely inactive other than occasional flushing noises, begins shooting steam and water droplets from its two vents (about 1½ minutes after the main cone started). The water jets of both cones become almost spray-like and take the shape of very elongated, inverted V's. Maximum height, between 45 and 60 feet, is reached during this period.

9. The water content of the column decreases steadily until about 7½ to 9 minutes after the eruption starts, when the main cone goes into a full steam phase. The noise is not great in volume but the billowing steam clouds rushing from both cones give it the appearance of a small steam locomotive buried in the ground. The steam phase is fairly constant until near the end of the eruption, when the pressure suddenly drops. Then the steam phase simply fades out. The total duration of the steam phase is about 15 minutes. The cone remains dry for several hours afterward. When the steam from the main cone begins to drift out of the cone rather than be ejected forcibly, the eruption is over.

10. The eruption cycle repeats from step 1.

Gem Pool: It was observed that this spring frequently increases its overflow periodically. It was quite noticable from the change in the noises of the water at the outlet and the flooding of some of the terraces toward the river.

Morning Glory Group

Fan, Mortar, and Spiteful Geysers: There was an interesting relationship observed between these geysers this month. All major eruptions were recorded for Mortar and Fan through the use of markers. The intervals (approximate only) varied between 2 3/4 and 5 3/4 days. The average was 4 1/5 days. In every case the major eruptions of Fan and Mortar were preceeded or immediately followed by an active cycle of Spiteful. The cycle of Spiteful usually preceeded the eruption by several hours. One to three eruptions of Spiteful occured before Fan and Mortar erupted.

These eruptions of Spiteful were different from the activity observed last year. Instead of filling and overflowing before every eruption as was the case last year*, only the first eruption was of this type. The

* Bob Woody did report one eruption he observed which was 10 feet high and started from an empty crater.

others in the cycle began explosively from a completely empty crater. There is a detailed breakdown of the behavior at the end of this report. The extent of the active periods was not determined, but by the next day the crater was always found quiet and overflowing.

A complete record of Fan's activity is given in the appendix.

The unnamed spring across the road from Spiteful showed definite connections with Spiteful. An appropriate name might be "Backwater" Spring because when Spiteful becomes active this spring drains completely and does not refill until Spiteful has ceased its activity. At the first of the season it had a very thick algae bed in the bottom of the crater. By this month the frequent drained periods had killed the algae and dried up the beds.

Chain Lakes Group

The northern-most Chain Lake Spring began overflowing around the 24th of the month.

Grotto Group

Spa Geyser: This feature continues to give more eruptions than usual this year. Although eruptions occur at long intervals, there have been several each month.

Rocket Geyser: Rocket continues to give more frequent major eruptions.

Grotto Fountain Geyser preceeded nearly all of Grotto's eruptions.

Giant Group

Oblong Geyser: Eruptions this month have continued to be of greater volume and height. Some eruptions were no less than 40 feet high. These large bursts were usually within the first minute and a half of play.

Catfish Geyser: Water was seen splashing from the top of this cone several times this month. It reached no higher than one or two feet.

Daisy Group

Bontia Pool continues to monopolize activity in this group. It is in continuous eruption but at times its splashing becomes greater. Its maximum height is about 3 feet. During the high activity water is discharged along the southern path and washes across it on the flat below the terrace.

The only other geysers active in this group were Pyramid, Bank, and Comet and they behaved as usual.

Grand Group

Grand Geyser: A great number of eruptions were observed this month. This was partly due to a special effort on my part but mainly due to an apparent slight increase in regularity and frequency. This stable behavior was caused by the complete inactivity of the "Percolator" and the Triplets. West Triplet was not seen in eruption until near the end of the month. The first eruption I observed was on the 30th. However, before almost every eruption of Grand, West Triplet would overflow for several hours. There were periodic fluctuations during some but the majority of the flowings were constant. The overflow continued until long after Grand's eruption.

A few active periods of East Triplet were observed. Very active bubbling and some pulsing would disturb the surface of the main crater and increase its temperature about 25 degrees F. These were not as forceful as those seen last year and were very infrequent.

The total burst distribution for Grand is given below:

TOTAL BURST DISTRIBUTION FOR GRAND GEYSER

Number of bursts	1	2	3	4	5	
Number of eruptions	0	12	14	6	4	Total = 36
Percentage	0	33	39	17	11	

Surprisingly it shows a marked increase in the number of bursts.

Turban initiated only six of the eruptions observed. The distribution according to bursts is given below:

BURST DISTRIBUTION OF TURBAN INITIATED ERUPTIONS OF GRAND

Number of Bursts	1	2	3	4	5	
Number of Eruptions	0	3	1	2	0	Total = 6
Percentage	0	50	17	33	0	%age of all = 17

Another very curious observation was the amazing number of eruptions where Turban and Vent went directly into the afterplay activity. A table of the distribution of these eruptions is given on the next page. The reasons for the change in behavior of these two geysers must be connected with the lack of activity from Rift and the Triplets but the relationship is apparently too complex to explain from field observations and the available literature sources.

Spring	Variation in Behavior
Sulfide Springs	Higher rate of bubbling and discharge.
Teakettle Spring	Level down, violent boiling.
Vault Geyser	Level down, irregular eruption intervals during Giantess'.

Midget Geyser: The geyser referred to as Midget is in the vicinity of Plume Geyser but further toward the central area of the Hill. It was so designated in Hamilton's Guide. Its behavior was consistent throughout Giantess' eruption and by the 11th it had again become dormant. The eruption consisted of several heavy surges, lasting only a few seconds. They were somewhat similar to Jewel Geyser's but of a more rapid nature. The splashing begins and ends abruptly and no steam phase was observed. The interval was 2 to 3 minutes. The maximum height was 6 to 8 feet. It was definitely not the Surge Geyser which is located several yards east of this feature.

Little Squirt Geyser: Little Squirt was seen in eruption on the 15th and the 30th.

Dome Geyser: Dome was seen in eruption on the 23rd and 24th.

Vault Geyser: Vault was active on the 3rd, 5th, 9th, 10th, and 29th. There was at least one on the 10th during Giantess' eruption. I saw one at 3:56pm which began with the crater completely empty and Giantess in a full steam phase eruption.

The springs on the flat across the road from the Lower Hamilton Store dried up during July.

Myriad Group

This group showed the most change during the month of July. The important activity occured in the area near Round Geyser and included three named features. These were Round Geyser, Abuse Spring and a small feature known as "Spectacle" Geyser. This area of the Myriad Group was studied in January of 1968 during the 8th Yellowstone Field Research Expedition of the Atmospheric Sciences Research Center, State University of New York at Albany. At that time "Spectacle" Geyser entered a period of activity of a magnitude which had not been recorded previously. It was designated "Spectacle" due to its nearness to and sympathy with "Spectacle Pools", now named Abuse Spring and West Pool. Since the Spectacles are no longer called that name it seems foolish to retain the name "Spectacle" for the geyser.

As a note of interest, the Three Sisters Geyser in the north crater was only seen erupting on the 25th of the month.

Abuse Spring: Abuse Spring is located in a very flat area near the southern edge of the Myriad Group. Its position places it in an almost direct line with the important geysers on this side of the Basin.

This summer Abuse showed varying activity. It was last known to have erupted after the 1959 Earthquake (except for a possible eruption last year). This month it was known to have erupted five times, once on the 7th and 12th, and three times on the 28th. Before the eruption of the 7th I observed the level of West Pool (of old Spectacle Pools) begin to drop. Before I left at 10pm the night of the 6th, it had gone down 8 to 9 inches and was continuing to do so between eruptions of Spectacle Geyser.

The first eruption of the 28th was the only one directly observed. The duration was 6m20s and was estimated to be 20 to 30 feet high. I arrived at the crater 2 minutes after the eruption had ended and found heavy wash marks all around the craters of Abuse, Spectacle and Round. Water was still in all the channels and stumps, rocks and a few sinter-covered bricks were strewn in all directions. There were a large number of bubbling centers in West Pool, Abuse, and Spectacle Geyser. This was the only time I had ever seen heavy bubbling in West Pool. There was also a small bubbling crack directly in the center of the barrier between West Pool and Abuse. In the hours following there were two more eruptions of a lesser magnitude. Both were followed by the bubbling in the cracks and a slow level-recovery period. The water level in Abuse about an hour after the 2nd eruption was 1½ feet below overflow into West Pool, which was down 2 feet. It took 2 hours for Abuse to overflow after the 3rd eruption. Spectacle Geyser was active after the 1st eruption but became inactive after the 2nd.

The eruption cycles of Abuse in all cases caused a switch of flow from Spectacle overflowing to Abuse overflowing into Spectacle. However, there were times when the flow shifted without an eruption of Abuse.

Spectacle Geyser: Although its present name is inappropriate its performance is well deserving of a name. Not only is its moderate discharge important to the area, but its explosive display is very impressive when at its best. Last month and the early part of July the geyser only had minor eruptions. I had rarely seen a few eruptions which reached 8 to 10 feet but the majority of the activity consisted of the low, ½ to 1½ foot splashes which lasted for several hours at a time.

The first continuous series of major eruptions I observed was on the 9th. Since that day with few exceptions all the eruptions have been that type. For the most part the intervals were between 30 and 40 minutes. Because I took most of my data near the time Round erupted, my statistics on Spectacle show more short intervals than would be considered normal. For a detailed account of the eruptive behavior of Spectacle Geyser and its effect on the near-by features see the article from the Journal of Geophysical Research, volume 74, no. 17, pp. 4206 - 4208, 8/15/69.

Shortly after major activity began it became apparent that Round was connected in some way with Spectacle Geyser. This connection was not obvious after the eruptions of Abuse. Although Abuse and Spectacle were both cloudy, Round's water was perfectly clear. However, on the 13th I noticed that after Round's 12:31am eruption that Spectacle was preparing to erupt. About 5¼ minutes after Round's eruption Spectacle had a major eruption. Since that time it has been observed that this occurs quite frequently.

Whenever Spectacle was active and Round erupted, Spectacle would follow up in about 3 minutes, even if it had erupted only 7 minutes before (see the table of statistics).

At times Spectacle would become dormant with Abuse overflowing into it. The cause for this shifting of the flow back and forth is not known, but during July the active periods were much longer than the dormant ones. Spectacle was active during the following days: July 1-7, 9-12, 13-15?, 17-28, 28-31.

This completes the notes for July. The appendices following the report summarize the geyser statistics gathered this month and present detailed information about the eruptions of a few of the more complex geysers.

Respectfully submitted,

Sam Martinez

SJM: 5/1980

Portion unavailable for transcription, 5/25/80

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UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: September , 1974

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Hot Spring Activity in the Firehole River Geyser Basins for August 1974.

Geyser activity was known to occur in the following springs:

LOWER GEYSER BASIN

Great Fountain Group

1. Great Fountain Geyser 2. Surprise Pool

White Dome Group

1. Crack Geyser 2. White Dome Geyser

Pink Cone Group

1. Bead Geyser 2. Labial Geyser 3. Narcissus Geyser
4. Pink Cone Geyser 5. Pink Geyser 6. one unnamed

Firehole Lake Group

1. Steady Geyser 2. Young Hopeful Geyser

Fountain Group

1. Clepsydra Geyser 2. Jelly Geyser 3. Jet Geyser
4. Silex Spring 5. Spasm Geyser 6. Sub Geyser
7. Twig Geyser 8. three unnamed

Kaleidoscope Group

1. Deep Blue Geyser 2. Honeycomb Geyser 3. Honey's Vent Geyser
4. Kaleidoscope Geyser 5. one unnamed

Sprinkler Group

1. Angle Geyser 2. Pithole Geyser 3. Sprinkler Geyser
4. two unnamed

River Group

1. Fortress Geyser 2. Mound Geyser 3. one unnamed

Quagmire Group

1. Snort Geyser

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Fairy Creek Group

1. Boulder Spring
2. Imperial Geyser
3. Locomotive Spring
4. Spray Geyser
5. three unnamed

MIDWAY GEYSER BASIN

1. Catfish Geyser (New)
2. Flood Geyser
3. Till Geyser
4. West Flood Geyser
5. two unnamed

UPPER GEYSER BASIN

Biscuit Basin

1. Avoca Spring
2. Cauliflower Geyser
3. Island Geyser
4. Jewel Geyser
5. North Geyser
6. Rusty Geyser
7. Shell Geyser
8. five unnamed

Cascade Group

1. Artemisia Geyser
2. Atomizer Geyser
3. Bench Spring
4. "Little Seismic"
5. two unnamed

Morning Glory Group

1. Fan Geyser
2. Mortar Geyser
3. Spiteful Geyser
4. one unnamed

Chain Lakes Group

1. Culvert Geyser
2. Link Geyser
3. one unnamed

Grotto Group

1. Grotto Fountain Geyser
2. Grotto Geyser
3. Riverside Geyser
4. Rocket Geyser
5. South Grotto Fountain Geyser
6. Spa Geyser

Giant Group

1. Bijou Geyser
2. Catfish Geyser (minor)
3. Oblong Geyser

Daisy Group

1. Bank Geyser
2. Brilliant Pool
3. Comet Geyser
4. Daisy Geyser
5. Pyramid Geyser
6. Radiator Geyser
7. Splendid Geyser
8. Bonita Pool
9. two unnamed

Round Spring Group

1. two unnamed

Grand Group

1. Bulger Geyser
2. East Triplet Geyser
3. Grand Geyser
4. Lime Kiln
5. Old Tardy Geyser
6. Rift Geyser
7. Turban Geyser
8. Vent Geyser
9. West Triplet Geyser
10. two unnamed

Castle-Sawmill Group

1. Castle Geyser
2. Churn Geyser
3. Crested Pool
4. Flume Spring
5. Oval Spring
6. Penta Geyser
7. Sawmill Geyser
8. Spanker Geyser
9. Spasmodic Geyser
10. Sprinkler Geyser
11. Tardy Geyser
12. Teakettle Geyser
13. Terra Cotta Geyser
14. "Sawmill's Neighbor"
15. two unnamed

Orange Spring Group

1. two unnamed

Geyser Hill Group

1. Anemone Geysers
2. Aurum Geyser
3. Beach Spring
4. Beehive Geyser
5. Beehive's Indicator
6. Depression Geyser
7. Dome Geyser
8. Lion Geyser
9. Little Cub Geyser
10. Little Squirt Geyser
11. Model Geyser
12. Plate Geyser
13. Plume Geyser
14. Pump Geyser
15. Scissors Spring (north)
16. Solitary Geyser
17. Vault Geyser
18. three unnamed

Old Faithful Group

1. Old Faithful Geyser
2. one unnamed ("Teapot")

Myriad Group

1. Abuse Spring
2. Lactose Pool
3. Round Geyser
4. Spectacle Geyser
5. Three Sisters North Crater East Vent
6. White Geyser
7. two unnamed

Black Sand Basin

1. Cliff Geyser
2. Spouter Geyser
3. one unnamed

Lone Star Group

1. Lone Star Geyser
2. one unnamed

Due to the unusual changes in some features in the Upper Geyser Basin, I concentrated my efforts there during August. As a result, no notes were taken in the Midway and Lower Geyser Basins other than the usual geyser times on the run.

Reports on one day trips to Crater Hills, Mud Volcano Area, and the Shoshone Geyser Basin have been prepared this month and are submitted separately. The report for Shoshone Geyser Basin includes data and notes from trips made in June and July as well as August.

UPPER GEYSER BASIN

Cascade Group

A new geyser developed in this group on August 25. While conducting the Biscuit Basin - Old Faithful Visitor Center walk past Atomizer, ranger-naturalist Tom Goldsmith saw a column of steam rising from a small geyser in eruption near the edge of the river just below the steep bank at that point. As soon as I heard about the new feature, I rushed to the scene. It had been several hours since the initial discovery and the geyser was no longer in eruption. Artemisia had in the meantime started overflowing and its water had flooded the vent of the new geyser. The water in the new geyser was quiet and gently overflowing. I was surprised to find that it was at a spot which had never shown signs of a buried vent and which I had passed over a week before. There were no traces of it there at that time. I placed a marker over the vent and checked it every day until I left the basins. No further eruptions of the geyser occurred.

Bench Spring: The feature once known as Bench Spring was buried by the construction of the Grand Loop Road and vented out to the side many years ago. This month it was observed to exhibit geyser-like behavior. At undetermined intervals the steam escaping from the tile pipe would shoot out for a minute or so at a greater than normal rate. This along with the fact that several small fumaroles have popped out in the road bed near-by indicate an increase in energy to this area. A temperature of the steam escaping from the pipe was taken on the 28th (?) and found to be 199.5^{o} F.

Morning Glory Group

Fan and Mortar Geysers: Nine eruptions were recorded for August. These were all determined by markers except for the eruption of August 28. Eruptions occurred on August 3, 6, 9, 14, 18, 20, 24, 26, and 28. The average, approximate interval this month was 3.2 days. This would indicate an increase in activity over July when the average interval was 4.2 days.

Spiteful Geyser: This geyser continued to exhibit frequent activity along with Fan and Mortar. Some time in August it took a turn for the better, becoming more active. An active phase began as it did last month, a few hours before Fan and Mortar's eruption. However, instead of stopping a few eruptions after Fan and Mortar ceased it continued to erupt at regular intervals for a day or more.

Chain Lakes Group

Bottomless Pit: No eruptions of this spring occurred during the activity of Link Geyser on the 29th.

Link Geyser: Link entered a major eruption cycle on the 29th, which lasted until the morning of the 30th. The two eruptions I was fortunate enough to see were very impressive. Both were near 80 feet in height. The discharge formed a sizable waterfall at the Firehole River and muddied the river for

a quarter of a mile. The lush algae beds which lined the gutter along the trail to the river were scalded and swept away by the boiling flood.

The 7:55pm eruption was acclaimed as the largest by those who had been there all day. It was preceeded by 5 seconds of overflow from the main crater and about 8 seconds of overflow from the indicator spring. The surface of the pool burst into a 20 foot fountain quite suddenly. The water then seemed to rocket out of the pool. The entire pool ascended in a hundred different jets. The entire mass was angled to the southwest and the highest jets reached close to 80 feet in height. Standing near the crater on the back side it was possible to feel heavy steam detonations in the cavern just below the surface. The water phase lasted 56 seconds and was followed by a 1m14s steam phase. In order to avoid repetition I will refer you to the reports of Scott Bryan and Rick Hutchinson for the full description of the preliminary indications of the eruptions.

The 10:59pm eruption was the last one I saw and probably the second to the last in the series. The crater overflowed for 18 seconds before the surface domed and burst. The eruption lasted 59 seconds and had no steam phase. The eruptions seen earlier had a short steam phase at the end of play. By the time of this eruption the large north Chain Lake was at the same level as the small side spring. This side spring started erupting ½ to 1 foot high 34 minutes before this eruption of Link.

I thought there might be another eruption in the morning so I returned at 2:30 am. The large north Chain Lake level was over the barrier between it and the side spring, which was still erupting ½ to 1 foot high. Link was boiling violently and the indicator spring was slowly rising. The indicator spring overflowed at 3:19am and was still overflowing at 4:00am when I left.

By the time the naturalist on geyser prediction, Steve Hodapp, came by, Link had already erupted. He checked and found the trail still wet. He estimated that it probably erupted between 6:30 and 7:00am. I made a temperature check at 10:00am on some of the features. The results were as follows:

Link	203° F
"Link's Indicator"	196° F
North Chain Lake above side spring crater	168° F

A marker was placed for Link but no further eruptions occurred.

An interesting observation was made during Link's activity. Several witnesses told me that Spiteful had erupted a short time before and after Link's eruption. Spiteful erupted 20 minutes before the 7:55pm eruption and 11 minutes before the 10:59pm eruption (the ones I observed). I was unable to stay long enough to confirm the eruptions following those of Link.

After the final eruption of the series, the water in all the pools of this sub-group became quiet and turned colloidal blue in color.

Grotto Group

The spring near Riverside Geyser in the river bottom was first seen steaming on the morning of the 16th. By the 18th it could be seen steaming during the day as well as in the morning.

Daisy Group

Daisy and Splendid Geysers: Occasional activity of these features occurred during August. Daisy was seen on the 7th, 19th, and 30th. I observed Splendid and Brilliant on the 30th, the day after Link became active. The eruptions of Daisy and Splendid at 8pm were very powerful and after the water play finished both went into great roaring steam phases for about 2 minutes. These unusual steam displays were not constant but consisted of frequent uncoordinated spasms of very deep growling and roaring. It sounded almost like rolls of thunder coming up the vents of both geysers.

The eruptions of Daisy which followed at about 11:15pm was preceeded by constant violent surging during the filling stage. The level in the crater was 2 feet below overflow when the eruption started.

Eruption cycles of Radiator and Brilliant Pool followed the eruption of Splendid.

Round Spring Group

North Round Spring: This spring is usually quiescent but several times this month it was seen vigorously bubbling. At these times the water level would be very low and just visible from the road.

Grand Group

Bulger Geyser: Whenever Crystal's li'l vent became active, Bulger Geyser would become dormant and go into periodic fits of growling and low splashing. The water level stayed at the top of the tube and boiled violently, causing the strange noises heard from the boardwalk.

East Triplet Geyser: Activity of this feature showed an increase this month. Several active pulsing cycles occurred throughout the month. These were strongly related to Turban's cycle and the pulsing periods of East Triplet would always start at the same point in Turban's interval.

East Triplet's active cycles never lasted more than one interval of Grand. The activity itself consisted of pulsing and violent bubbling with a temperature increase of from 25 to 45 degrees. There is some overflow associated with the pulsing which is distinctly separate from that supplied by Grand. The small upper vent oozes a little water and bubbles slightly along with the activity in the main crater. The activity lasts about 10 minutes.

The most violent of these I observed occurred on the 5th. During the height of the activity the boiling in the main crater reached 8 inches high.

Grand Geyser: The behavior of Grand was more normal this month compared with July. No unusual eruptions were observed and the burst distribution

was similar to that seen last year. The total burst distribution is given below:

TOTAL BURST DISTRIBUTION FOR GRAND GEYSER

Number of Bursts	1	2	3	4	5	
Number of Eruptions	1	9	10	1	0	Total = 21
Percentage	4.8	42.4	48	4.8	0	

Turban was seen initiating only 4 of the eruptions. The distribution for these eruptions is given in the next table.

TURBAN INITIATED DISTRIBUTION FOR GRAND GEYSER

Number of Bursts	1	2	3	4	5	
Number of Eruptions	0	3	1	0	0	Total = 4
Percentage	0	75	25	0	0	%age of all = 19%

Fewer eruptions where Turban and Vent went directly into afterplay were observed during August. The distribution for these is also given in the table below:

BURST DISTRIBUTION OF INTO AFTERPLAY ERUPTIONS OF GRAND

Number of Bursts	1	2	3	4	5	
Number of Eruptions	1	3	4	0	0	Total = 8
Percentage	12.5	37.5	50	0	0	%age of all = 38%

Generally the behavior of Grand this month was more normal although there was an eruption of only one burst seen on the 3rd.

Old Tardy Geyser: The small hole I refer to as the "Li'l Vent", which is located in the runoff channel of Crystal Spring was very active this month. Whenever it goes into eruption Old Tardy enters a series of 10 minute intervals. Li'l Vent's eruption produced a very rapid "push-push-push" sound which closely resembles the sound of a small steam engine.

The water supply to this small feature (Li'l Vent) seems to be very restricted and strongly dependent on the overflow from Crystal Spring. During one active cycle on August 21 Crystal Spring's level dropped 2 inches

geysers in the Park and the daily eruptions seen in 1972 were a thrill to many of the visitors and a high point for several guided walks through the basin.

Myriad Group

Three Sisters Springs: The small geyser in the north crater became active on the 25th and 31st. It has been inactive most of the summer and nothing unusual was seen about any of these eruptions.

Lactose Pool: This feature is indicated on the USGS map as a mud spring near White Geyser. This month it was seen in eruption several times. The eruption consisted of splashing 3 to 4 feet high in the northwest corner. There were two centers of activity and the temperature of both was 200° F. The first eruption I saw was on the 1st. This was the only one I saw in its entirety but there were at least two others. The duration was less than 1½ hours.

On August 3 the level of the springs in the area near this feature rose 2 to 6 inches due to some rain showers. The small spring next to White ceased to erupt for several days due to the cooler ground waters infiltrating the plumbing.

Abuse Spring: Two eruptions occurred, one on the 15th and the other on the 22nd. The second one was small, and lasted 4 minutes. The wash from this eruption reached 2 to 3 feet out from the crater. The West Pool remained at a high level until after the eruption of Abuse on the 22nd.

Round Geyser: Round's behavior was more erratic this month, probably because of Spectacle's vacillations. The data is summarized in the table of statistics in the appendix. A complete eruption cycle is also included there.

A few more short intervals were seen this month. These are not preceeded by overflow and begin suddenly without any warning. The 2½ hour interval coincides with a secondary steam phase which can usually be expected to occur at that time. The steam phases this long after the main eruption are accompanied by violent surging and splashing just below the ground level and inside the tube. So much water present so soon after the eruption attests to the good water supply available. No more than one short interval ever occurred together in a continuous series. The short interval was always followed by an average length interval, giving unsuspecting observers the impression of a 15 hour interval.

I believe that if a serious study is made of Round it will be found to be a geyser of varied but predictable behavior patterns. Height measurements of 133 and 105 (two) feet have proven it to be a geyser of first magnitude. This and the fact that it is predictable (I did it.) make it a high candidate for the prediction board, and for the attention it deserves as one of the major geysers in the Upper Geyser Basin.

Due to the delicate nature of the sinter in the vicinity of Round, it would not be wise to extend boardwalks into the area. However, a good observation site is found just inside the trees to the south, along the

below overflow instead of overflowing and pulsing. Without water flowing in from Crystal, Li'l Vent's splashing gave way to constant low roaring. The steam was ejected nearly horizontally from under Crystal's crater for some distance out over the runoff channel.

Castle-Sawmill Group

Oval Spring: Oval showed minor eruptive behavior again this month. I observed minor eruptions on the 17th and 21st. The water level was almost out of sight in the bottom of the crater. The water was splashing up along the side and corner away from Penta's cone. The height was hardly more than 1 foot, sometimes 1½ to 2 feet. Even then the water never reached ground level. The duration of these eruptions was never determined.

Spasmodic Geyser: Two unusual ovservations are worthy of note. On August 21, during an eruption of Spasmodic, the level of the south pool remained six feet below overflow while the north pool filled and overflowed into it. Oval Spring was erupting at this time which might explain part of the reason. There was not enough time available to make further observations of the complex behavior of these features this month.

On the 24th, during an eruption of Spasmodic, Penta began erupting. Instead of stopping as was the custom, it continued to erupt throughout Penta's eruption and for some time thereafter.

Sawmill Geyser: The small geyser on the edge of Sawmill's crater (I shall call this Sawmill's Neighbor for the present.) was seen erupting several times this month. Its eruptions seemed to follow short eruptions of Sawmill. Sawmill's Neighbor is not active enough to permit even the most general speculations on its behavior.

Castle Geyser: Eruptive activity remained stable through August. On August 3 Jerry Carlson and myself discovered a new fumarole patch directly under the boardwalk at Castle Geyser. It was located where the boardwalk starts across the runoff channels to the east of the asphalt trail. It shows a curious intermittancy in activity. At times during cold weather it is barely visible, while on other very warm days it throws up a considerable cloud of steam and a respectible amount of heat.

Geyser Hill Group

Beehive Geyser: Scanty records were taken during August. It was not often seen more than once a day and at times no eruption was seen for several days. It seems probable to conclude that there was no more than one eruption during a 24 hour period and perhaps even less than that. Beehive's Indicator was seen frequently but usually only as a solo. It erupted every few hours starting about 5½ hours after the last eruption of Beehive. After many of these solo eruptions, one leads into an eruption of Beehive.

It is a shame that the short intervals of 1972 and 1973 did not continue for a few more years. Beehive is one of the most spectacular

old Howard Eaton Trail. I strongly recommend that information on Round pertainent to its present behavior be made available to the naturalists next summer to up-date that given in Marler's Inventory and make them more appreciative of its importance. Just because it is on the back side of the Inn doesn't mean that it isn't worthy of the attention given other geysers of lesser magnitude.

Spectacle Geyser: The activity of this geyser is still somewhat mysterious. It was active on the following days during August: 1-4, 13-15, 17-22, 27-31, It has always puzzled me how its active phases could shift so suddenly and dramatically.

In 1968 it was thought to be a new geyser. I have always suspected Spectacle of being the mysterious geyser once described by Allen and Day during their work of the '30's*. The iron pipes leading to Abuse Spring and the general size of the related features as described in the text make it easy to believe them to be the same.

The curious sinter formations around Spectacle strongly resemble cemented sand and trash which would be expected for the geyser of Allen and Day. A search through their records might reveal the identity of the geyser and its location.

A number of interesting materials have been thrown out by Spectacle's eruptions so far. The following items have been identified in the crater and runoff channels:

1. A number of different types of rock, both volcanic and sedimentary. Some of the sinter is very unusual in shape and color. One tremendous piece of hydrothermally sculpted sinter of several pounds weight, representing the finest geyser tube deposits I have ever seen,was thrown out and preserved for future study in the Visitor Center. Some of the smaller pieces of sinter were bright green in color and similar to some thrown out by Abuse Spring later on were found in the runoff channels.

2. Pieces of metal and glass included bottle caps, pipe scales, a "LUCKY" beer can, lightweight metal strips 1" wide, some metal foil, a few nails, and some washers and a small bolt.

3. Some bone fragments and ends (introduced, beef?).

4. Pieces of broken vitrified clay pipe.

5. Heavily silicified pieces of cloth and paper, some imbedded in the crater walls.

A complete eruption cycle of Spectacle is summarized in the appendix.

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* Allen, E. T. and A. L. Day, The Hot Springs of Yellowstone National Park, 1935, Carnegie Institute of Washington Publication 466, pp. 261-262.

I would like to express my deepest appreciation to all the naturalists and rangers who have helped make these past three summers an enjoyable and rewarding experience. My thanks also go to the rest of the geyser hounds in the Old Faithful area without whose help this report would not have been as complete.

Sincerely,

Sam Martinez - V.I.P.

APPENDICES

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II. TYPICAL ERUPTION CYCLE FOR ROUND GEYSER 16

III. TYPICAL ERUPTION CYCLE FOR SPECTACLE GEYSER 18

APPENDIX I: GEYSER STATISTICS FOR AUGUST 1974

Group	Spring	Data Explanation	Min. Value	Max. Value	Avg. Value	No. Data Pts.	Notes
CRATER HILLS							
	Sulfur G.	Pause btw'n ers.	---	---	4m01s	1	
UPPER GEYSER BASIN							
Cascade	Artemisia G.	Dur.Heavy ov.	40s	1m30s	1m05s	2	Just B4 eruption.
"	"	Duration of er.	12m22s	17m	14m30s	3	
"	"	Cease ov.B4 end	---	---	1m10s	1	end of eruption*
"	Atomizer G.	Dur.major er.¢	---	---	8m44s	1	¢ water phase.
"	"	Dur.steam phase	---	---	11m20s	1	
"	"	Total Duration	---	---	20m04s	1	
"	"	Dur.B4 2nd cone	---	---	1m26s	1	
"	"	Dur.minor er.	---	---	31s	1	
Morning Glory	Fan & Mortar	Interval #	1.75d	5d	3.2dy	8	# Approximate.
	Spiteful G.	Duration	2m20s	5m20s	3m19s	9	
" "	"	Empty aft.er.end	24s	25s	24.5s	2	
" "	Mortar's Low Vent	Duration	53s	3m02s	1m38s	3	
" "		Int.aft.Spiteful	55s	4m17s	2m36s	3	After Spiteful starts.
" "	Fan's river vents	" " " "	2m20s	3m15s	2m47½s	2	
Chain Lake	Link Geyser	Dur.water phase	56s	59s	57.5s	2	
" "	"	Dur.steam phase	---	---	74s	1	
" "	"	Dur.ov.B4 er.	15s	18s	16.5s	2	
Grotto	Rocket G.	Duration	3m35s	6m46s	4m55s	3	
Giant	Oblong G.	Duration	5m30s	5m45s	5m37½s	2	
Daisy	Comet Geyser	Dur.quiet aft.=	---	---	41m	1	= Splendid erupts.
"	Brilliant P.	Duration of er.	15s	35s	23.6s	7	
"	"	Interval	1m13s	3m33s	2m10½s	6	
"	"	Int.aft.Splendid	---	---	18m48s	1	
"	"	Dur.active cycle	---	---	13m20s	1	
"	Daisy Geyser	Duration	3m42s	4m08s	3m55s	2	
"	"	Int.to cone spl.	48m50s	49m30s	49m10s	2	After last eruption.
"	Radiator G.	Duration	---	---	3m15s	1	
"	"	Int.aft.Splendid	---	---	13m10s	1	
Grand	Bulger G.	Duration	9m18s	12m00s	10m39s	2	
"	Grand Geyser	Total Duration	10m14s	14m12s	12m13½s	20	
"	"	Dur.1st burst	8m22s	11m36s	9m55.4s	20	
"	"	Dur.other bursts	26s	143s	45.6s	30	
"	"	Dur.pauses	30s	78s	45.7s	30	
"	"	Dur.waves B4 er.	1m15s	4m10s	2m09s	8	
"	Turban G.	Normal Duration	3m18s	6m25s	4m57s	22	
"	"	Normal Interval	18m26s	21m50s	19m58s	14	

* End of eruption defined as the point where the boiling up and surging stops and the pool becomes quiet.

Group	Spring	Data Explanation	Min. Value	Max. Value	Avg. Value	No. Data Pts.	Notes
UPPER GEYSER BASIN continued							
Grand	Turban G.	Dur.with Grand	12m17s	13m32s	12m59s	9	
"	"	Dur.B4 Grand*	21s	57s	32s	4	* Turban initiated.
"	"	Int.aft Grand¢	35s	121s	62.5s	10	¢ Grand initiated.
"	"	Dur.aft.Grand st	48s	172s	87.6s	12	Aft. Grand stops.
"	Vent Geyser	Total Duration	1m30s	13m14s	12m33s	10	
"	"	Dur.aft.Gr.stops	1m41s	3m24s	2m31.6s	11	
"	"	Int.aft.Gr.begin	43s	3m02s	2m18s	16	
"	Old Tardy G.	Duration	35s	23m10s	7m44s	6	
"	" "	Interval	2m00s	17m10s	10m09s	3	
"	Rift Geyser	Afterplay#	---	---	31m51s	1	# Int.aft.Grand
"	"	Stop B4 Gr.er.	---	---	2m35s	1	(stops.
"	West Triplet	Dur.overflow	25s	2m30s	1m44s	5	
"	" "	Dur. of er.	22s	7m30s	5m01s	4	
"	" "	Int.aft.Gr.stops	1m48s	9m53s	7m22½s	4	
"	" "	Ov.aft.spl.begin	19s	2m32s	1m53½s	4	
"	" "	Cease ov.aft.er.	20s	50s	40s	3	
"	Gr.group	Int.to Turban	6m34s	12m51s	9m58s	3	
"	afterplay	Int.to Vent	8m04s	14m18s	10m57s	3	
"	" " "	Int. to Grand	8m24s	14m51s	11m45s	3	
"	" " "	Int.to T.& V.$	2m58s	10m28s	7m51½s	4	$ General figure on
Castle-	Castle G.	Dur.water phase	---	---	15m15s	1	(Vent and Turban
Sawmill	Crested Pool	Duration of er.	---	---	45s	1	(made from a distance.
" "	Sawmill G.	Duration	22m30s	57m00s	39m45s	2	
" "	"	Ov.reaches river	2m43s	3m15s	2m59s	2	After er. starts.
" "	"	Dur.ov.B4 er.	---	---	3m30s	1	
" "	Sawmill's N.	Duration	---	---	6m	1	
GeyserHill	Aurum Geyser	Duration	---	---	27s	1	
" "	Beehive G.	Duration	5m45s	6m35s	6m10s	2	
" "	Lion Geyser	Duration	2m20s	7m45s	4m21s	5	
Myriad	Abuse Spring	Int.aft.Spec.er.	---	---	10m37s	1	until Abuse ovs.into
"	Round Geyser	1st ov.B4 er.	3h20m	3h37m	3h28m	3	(West Pool.
"	"	1st boil at ind.	19m35s	46m	29m44s	3	Deceptively low due
"	"	" " " "with ov.	9m23s	79m35s	33m00s	5	(to HO types with no
"	"	Heavy ov.B4 er.	1s	56s	16.3s	10	(ov.to south and
"	"	Dur.1st burst	10s	35s	21.7s	14	(absence of this for
"	"	Dur.1st pause	2s	13s	5.8s	14	(others.
"	"	Dur.2nd burst	2s	11s	6.8s	13	
"	"	Dur.2nd pause	1s	5s	3.4s	13	
"	"	Dur.3rd burst	2s	10s	5.5s	13	
"	"	Dur.3rd pause	1s	17s	3.4s	13	
"	"	Dur.4th burst	3s	5s	4s	2	
"	"	Dur.4th pause	2s	3s	2.5s	2	
"	"	Dur.Prelim.brsts	25s	56s	40.7s	15	
"	"	Dur.main water	40s	55s	48.6s	20	
"	"	Dur.main steam	4m15s	6m15s	5m26s	25	
"	"	Int.to 2nd steam	22m25s	25m33s	24m37s	7	

Group	Spring	Data Explanation	Min. Value	Max. Value	Avg. Value	No. Data Pts.	Notes
UPPER GEYSER BASIN concluded							
Myriad	Round Geyser	Dur.2nd steam	4m10s	6m00s	4m50s	10	
"	"	Int.to 3rd steam	51m00s	56m35s	54m02s	3	
"	"	Dur.3rd steam	4m22s	4m40s	4m30s	3	
"	Spectacle G.	Interval	7m13s	43m05s	28m29s*	24	* Deceptively small.
"	"	Int.aft.Round er	7m37s	30m00s	18m46s	7	Int.aft.the one
"	"	" " " " " ¢	1s	10m40s	3m22s	10	(triggered by Round.
"	"	Duration	43s	84s	61.7s	36	¢ Int.to one triggered
"	"	Dur.bub.B4 er.#	18s	135s	46s	9	(by Round's er.
"	Three Sister	Duration	---	---	2m13s	1	# From the small
"	N.crater E.v	Interval	---	---	9m17s	1	(cracks in the
"	White Geyser	Duration	19s	34s	24.9s	10	(crater.
"	"	Interval	2m57s	7m38s	4m13s	9	
HEART LAKE GEYSER BASIN							
Rustic	Rustic G.	Duration	41s	57s	47.6s	8	
"	"	Interval	11m07s	12m05s	11m34s	7	
"	"	Height	12ft	24ft	18.9ft	8	
"	#3 Geyser$	Duration	1m30s	2m36s	2m12s	8	$ See 12th Ann. Report
"	"	Interval	6m45s	9m03s	8m18s	7	(of the USGGS, 1878.
"	Prometheus	Duration	1m25s	3m10s	2m00s	4	
"	"	Interval	9m10s	11m20s	10m07s	3	
Middle	"Glade" G.@	Duration	53s	56s	54.5s	2	@ I never found your
"	"	Interval	8m38s	5h06m	---	2	(1st eruption data,
							(Rick. --- S.M.
SHOSHONE GEYSER BASIN							
Orion	Union Geyser	Interval**	---	---	3h07¼m	1	** Between active
"	"	N.Cone-Dur.water	7m45s	17m00s	12m22s	2	(cycles.
"	"	" " Dur.steam	2m30s	5m35s	4m02½s	2	
"	"	C.Cone-Dur.water	---	---	5m43s	1	
"	"	" " Dur.steam	---	---	10m05s	1	
"	"	S.Cone-Duration	15m40s	19m30s	17m35s	2	
"	"	Dur.Prelim.Puffs	---	---	1m47s	1	B4 2nd eruption.
"	"	Dur.Aux.Steam ph	4m03s	7m13s	5m38s	2	
"	"	Dur.steam phase=	33s	64s	46s	3	= lulls.
Minute Man	Twins	Duration¢¢	---	---	60s	1	¢¢See Shoshone Report.
Little Giant	Little Giant	Duration	6m40s	9m45s	8m12½s	2	"The Pirates"
South	UNNGN Coral	Duration	4m53s	7m03s	5m58s	2	
North	UNNGN Grotto	Duration	8s	35s	23.7s	14	"TB" Geyser
"	" "	Interval##	4m33s	18m22s	13m44s	14	##Cyclic.
"	UNNGN Lion	Duration	---	---	1m35s	1	"Slot" Geyser -This
							(is actually Lion
							(Geyser--SM, 5/25/80.

APPENDIX II: TYPICAL ERUPTION CYCLE FOR ROUND GEYSER

Time to Eruption	Notes
3½ hours	1. Crater begins to overflow to the north.
1/3 to 1½ hours	2. Boiling at the indicator begins (south side of the crater).
10min. to 1½hours	3. Overflow to the south caused by boiling-up at the indicator begins.
close	4. Water around the cone along the south side from the indicator boil has filled the slight depression outside the cone deposit. The water usually doesn't reach overflow down the south channel until the eruption begins.
0 to 2 minutes	5. About 50% of the eruptions are preceeded by a heavy overflow which may or may not be after the southerly overflow begins. The water in the crater suddenly lifts about 2 inches, sending water rushing down all sides of the cone. This leads into the first burst which starts less than a minute later.
0	6. The eruption usually starts with a number of preliminary bursts, commonly three in number but there can be any number between 0 and 4, inclusive. Those not preceeded by any bursts are always of the heavy overflow type. The first burst is the longest, lasting 10 to 35 seconds. It is usually 2 to 5 feet high. The second burst lasts 2 to 15 seconds and is 2 to 8 feet high. The last burst is very short usually a few seconds, but it can be as long as 10 seconds. The height of the final preliminary burst varies from 1 to 8 feet. Each burst in this series is separated by pauses from the others. The first pause is the longest, being between 3 and 30 seconds. The later pauses are less than 5 seconds long. The most impressive aspect of these preliminary bursts is the suddenness with which they start and stop.
-30 to -60s	7. After the last preliminary burst there is a short pause of from 0 to 15 seconds after which the main burst begins. The water bursts up to the 3 to 7 foot range and continues to build higher and higher. The water reaches the maximum height in about 15 seconds. The column is angled to the northeast and is very impressive on a warm calm day, reaching 100 to 135 feet. The column quickly drops as the water content diminishes and the water phase slowly fades into a unique steam phase series. The steam phase is very interesting. The steam rushes out in puffs giving a deep whooshing noise with each billow of steam. Like the preliminary bursts, the steam phase

ends abruptly after 5 minutes and the cone becomes completely quiet.

8. After 25 to 30 minutes the steam phase is repeated. This one is very much like the first one. It is a little shorter and less noisy, but in appearance it is identical. It ceases abruptly after about 4 3/4 minutes.

9. Secondary steam phases occur at increasing intervals until about 6 to 9 hours before the next eruption. The later ones have more water associated with them and a great deal of surging and splashing-up occurs inside the crater. The water sometimes jets up 4 or 5 feet above the top of the cone.

   Approximate intervals for the first 3 secondary steam phases are 25 minutes, 52 minutes, and 90 minutes (all from the beginning of the water phase of the previous eruption.)

10. Occasionally at the time of the 2½ hour secondary steam phase there is instead another major eruption. Very little is actually known about this type of eruption. The water quietly rises with some splashing from out of sight to within a few inches of the top of the cone in less than a minute. The bursting takes place and the eruption continues as it would normally. The overall effect is to push the next eruption time ahead 2½ hours.

11. After the last steam phase the water quietly begins to rise. Overflow occurs about 2 to 3 hours after water appears in the bottom of the tube. Sometimes the filling is accompanied by constant violent boiling until the water reaches 3 feet below the top. The boiling diminishes as the level rises and ceases at the 3 foot level.

12. Water begins overflowing to the north. The cycle repeats from step 1.

APPENDIX III: TYPICAL ERUPTION CYCLE FOR SPECTACLE GEYSER

Time from Eruption	Notes
0 to 1 minute	1. The eruption ceases. The water level retreats to just above the vent, then rises 1 inch and begins to fill the crater slowly. Abuse is at its lowest level but is rising.
8 to 11 minutes	2. Abuse Spring reaches the level of West Pool and overflows into it.
	3. Spectacle pulses slightly and rocks while it fills very slowly.
20 to 35 minutes	4. Spectacle is overflowing into Abuse constantly over the low ridge along the man-made channel leading into Abuse from Spectacle. It's about 5 minutes till the next eruption.
24 to 39 minutes	5. Spectacle suddenly increases its overflow rate dramatically.
25 to 40 minutes	6. Bubbling is seen in Spectacle's crater from several of the small cracks that criss-cross the crater. It's about 45 seconds to the eruption.
25½ to 40½ minutes	7. The pulsing in Spectacle becomes frantic and the water begins to escape over the east edge of the crater. Just before the eruption begins a few bubbles break the surface over the vent.
	8. The eruption begins with a wild splashing over the vent. The splashing grows into a diffuse column ejected through the pool at an angle to the south and east. The water jets reach between 15 and 20 feet. The water begins to descend after about 30 seconds of eruption time. The splashing remains at 2 to 3 feet until the last few splashes terminate the eruption. The total duration is about 1 minute. Abuse Spring begins to drain shortly after the heavy overflow and surging sends the water over the 2 to 4 foot range and into the bursting stage.
	9. The cycle repeats from step 1.

Intervals varied for a number of reasons:

1. Eruptions lasting 30 to 40 seconds were usually followed in 12 minutes by a very long (65 to 80 second) eruption of the very tall variety.

2. Round induced eruptions.

3. Abuse could surpress the eruptions by overflowing into Spectacle.

Duration varied due to the magnitude of the eruption. Very small eruptions, 1 to 3 feet high, could last several minutes and were followed by a short interval. Eruptions near the usual height, 15 to 20 feet, lasted about 1 minute and were followed by a 25 to 40 minute interval. Unusually short eruptions, 40 seconds or less, of the maximum height variety were followed by a short interval and an unusually large eruption up to 25 feet in height, lasting over 70 seconds and as long as 100 seconds. The crater runs full between the two related eruptions and the pulsing is fairly constant until the second eruption.

Height of major eruptions varied between 10 and 25 feet. Minor eruptions were 1 to 4 feet high.

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: August 5, 1974

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Notes on a Trip to Heart Lake Geyser Basin on August 5, 1974.

On August 4 I accompanied Rick Hutchinson and others to the Witch Creek thermal areas and remained there through the 5th to make observations. Time severely limited the observations to the Rustic, Fissure and Middle Groups.

Most of the data obtained was for the springs in the Rustic group. The geyser eruption data we obtained is given below:

Rustic Geyser

eruption times	Max. Height
11:23:30-11:24:27	12ft
11:34:45-11:35:33	24ft
11:46:40-11:47:30	13ft
11:58:45-11:59:35	22ft
12:10:12-12:10:53	20ft
12:21:19-12:22:07	18ft
12:33:07-12:33:49	18ft
12:44:30-12:45:15	25ft

#3 Geyser (Rustic Group)

eruption times	Height
11:32:20-11:34:30	5ft
11:41:20-11:43:33	5ft
11:49:30-11:52:01	8ft
12:06:15-12:07:45	6ft
12:15:08-12:17:14	8ft
12:22:57-12:25:33	
12:32:00-12:34:10	
12:40:25-12:42:55	

Prometheus

eruption times	Height
11:57:30-11:59:15	4ft vertical,6 ft horizontal
12:07:20-12:08:45	4ft
12:18:40-12:20:20	4ft
12:27:50-12:31:00	

"Glade" Geyser

Heavy overflow and burst	15:07
Heavy overflow and burst	15:30:15
Heavy overflow and burst that moved marker	15:32:58
Heavy overflow and burst	15:33:20
BIG Heavy overflow and burst	15:37:12
Heavy overflow and burst	15:41:05, 15:41:19, 15:41:23
Heavy overflow and burst	15:43:15
ERUPTION	15:46:12-15:47:08
ANOTHER ERUPTION	15:54:50-15:56:43, about 48 to 50 feet.



5010-106

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Sam Martinez

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist DATE: September , 1974

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Report of a Trip to the Mud Volcano Area made on August 23 and 30, 1974.

The purpose of the two trips was to visit the new Sour Lake Mud Volcano which appeared this summer. The feature was tremendously interesting not only for its size but for its power as well. Mud lumps were being thrown-up over 30 feet above the cone on the 23rd. There were 9 main centers of activity in the mud pool and a very active steam vent area on the west side near the top of the cone on the inside.

The small mud pot or spring near the new crater, which I was told had been there for some time, was of a different chemical make-up. The color of its mud was slightly pinkish in hue. The color of the new mud volcano was a blue-gray , with small lumps of white rock mixed in with it.

The mud slinging on the 23rd was very spectacular, but something else occurred which was very interesting. A section of the crater wall on the east side slipped into the pool exposing the strata above the level of the mud.

By August 30 the mud had become thinner, resulting in a less spectacular behavior. Mud around the cone was completely dry and the mud inside the cone was being thrown only as high as the edge of the crater. There were many more centers due to the thinner mud consistency and the north end of the crater was partially choked by a large block of dried mud which had fallen directly on top of the most active center of the 23rd.

The excess water proved to be only temporary. I received word after I left the Park that it had dried out and become very active again.

Only time will tell if this new feature will continue to function in its present, unique manner. However, if past experience can be trusted these features tend to be very delicate and erratic. Hopefully this spectacular salse will continue to operate undisturbed for several more years. Its close proximity to Sour Lake may bring about an untimely demise if it continues to grow and deepen its crater.

Sam Martinez



5010-108

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MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Old Faithful Sub-District Naturalist

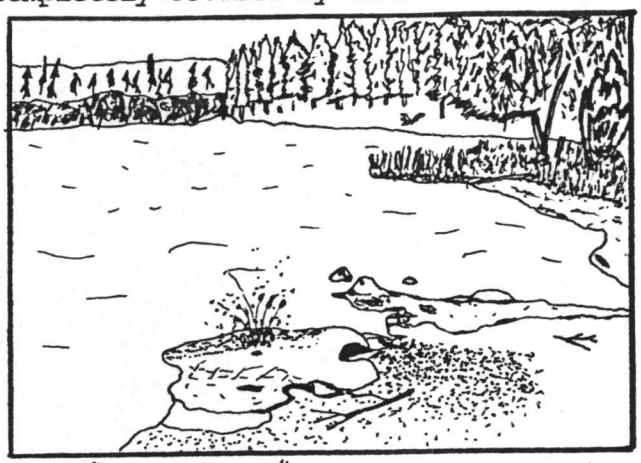
DATE: September , 1974

FROM : Sam Martinez - Volunteer in the Park

SUBJECT: Report on Shoshone Geyser Basin Covering Trips Made June 16-17, July 7-8, and August 11-12, 1974.

I took greater interest in the general activity of this basin this year. With each succeeding trip the features showed an increase in energy output. This was not true in all cases but generally most became more active. By August 12 things were really jumping. I saw nearly every spring I knew to be a geyser in eruption on the August visit. The only exceptions were Bronze Geyser, "Locomotive" Geyser, and a couple of old cones which have been dormant for many years. There was even a newly formed geyser in the South Group near Three Crater Spring.

Shore Group: Most of these springs are unimportant, sulfurous oozes. However, the spring shown as #1 on the 1878 map, which I call the "Burning Eyes", are clear, alkaline or mixed type springs. During June they were completely covered by lake water.



"Burning Eyes" Springs, Shore Group #1

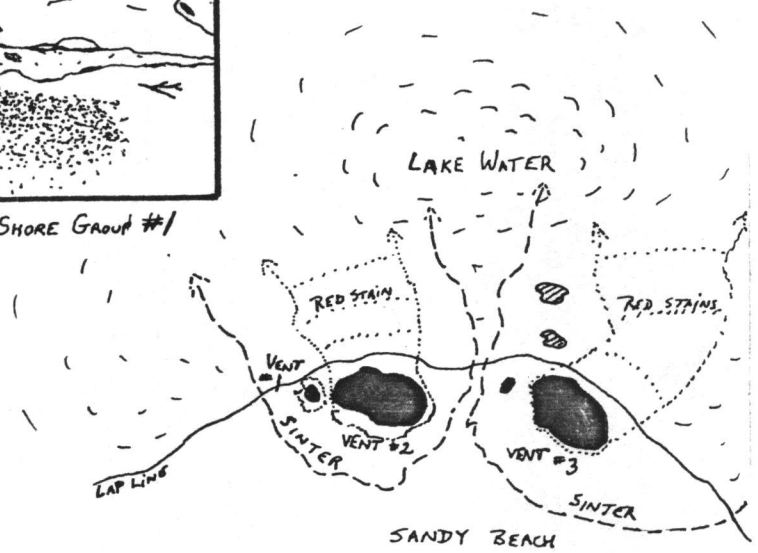


Figure 1: Location and sketch diagram of #1 in the Shore Group, "Burning Eyes".

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5010-108

On my July visit the #3 vent was the only one in the lake itself. The other two vents were slightly above the lake and very active. The #1 vent showed geyser activity during this time, erupting 6 to 12 inches high every 3 to 4 minutes. The eruptions started explosively and lasted 20 to 30 seconds. The #2 vent overflowed periodically in sympathy with #1 and bubbled vigorously. A few bubbles rose in the #3 vent occasionally. By August all the vents were well above the lake level and the #3 vent was the most active. It was vigorously erupting steadily and although the discharge was not great the noise was audible from a fair distance. The height of the boiling was about 6 inches. The #1 was dormant and the #2 vent's level fluctuated sympathetically with it. The bubbling in the #2 vent was not as vigorous as it was in July. In August and July the temperature in all three vents was 201° F (#3 was at 195° F in July.).

#11-#12: The water level dropped 1 foot between June and August, resulting in two separate springs instead of one with two vents.

Lake Group

The springs were all under the lake water in June and also at the time of my July trip. Their appearance during August 12 was very similar to that described in Hayden's 1878 Report.

Orion Group

Taurus Geyser: Unlike most of the features in the basin this feature was unusually active during the June visit. During that time it erupted every 10 to 15 minutes (average = about 13.5 minutes) for 3½ to 7 minutes. The height varied from 1 to 4 feet. These were the largest eruptions I have ever seen of this feature. During the July and August trips the height was only 4 to 12 inches.

Union Geyser: I was lucky enough to witness two eruptions of this geyser on August 12. The chronological sequence is given below:

AUGUST 12, 1974

14:15	The first eruption began.
14:32	North cone enters the steam phase.
14:34:30	Loud steam phase ceases; gentle steam from all cones continues.
14:35:23	Loud steam resumes till ?.
17:18:00	Puffing begins.
17:22:15-17:30:00	North cone water phase.
17:19:47-19:25:30	Center cone water phase.
17:19:55→	South cone steam phase (no water phase).
17:35:35	Loud steam ceases.
17:36:15-17:43:48	Loud steam.
17:44:32-17:48:35	Loud steam.
17:49:08→	Loud steam.

The eruptions were very impressive and powerful. The near-by spring, #20, erupted all during Union's eruptions to almost 1 foot high. The spring

was highly agitated around the edge where the water normally boils up only a few inches. This unusual activity which was also seen last year would indicate connections to the Union Geyser.

Minute Man Group

Minute Man Geyser: Many eruptions of this geyser were seen during every visit. One statistic was obtained on the first visit. The pool overflowed 18m50s before the first eruption of the cycle.

At no time during any of my visits to Shoshone Geyser Basin have I seen the pool by Minute Man erupt. It's apparent that it doesn't erupt as often as it once did.

in addition to the major geysers of this group, several other features along the creek were seen erupting. Those with numbers were #4, #6, #8, and #16. Also the small spouter associated with the Black Sulfur Spring continued to erupt constantly without any signs of letting up.

Twin Cones: On August 12 these old cones were seen in "eruption" for about 1 minute. The eruption consisted of boiling down in the vents, which spit spray up and out of both cones. This activity was accompanied by a low growl and a plume of steam. The interval of this activity was not determined.

Little Giant Group

"Platform" Geyser: This feature is located on the side of the creek opposite Little Giant and 30 feet downstream from the bend at the Little Giant Complex. The name "Platform" comes from the appearance of the deposit. Although it has been partially eroded away by the creek, the seat of the geyser strongly resembles a platform of mortar molded in place. The crater atop the deposit is very shallow, consisting mainly of a circular maze of small depressions and ridges. The geyser tube is only about an inch and a half in diameter and the fountain-like eruption is like a small cone geyser. The height of the eruption is only about 2 feet but the form of the column is unusually handsome. The interval of this gyeser is quite variable as is the duration. In activity it is very much like Old Tardy, whose cyclic operation defies prediction.

Little Giant Geyser: Markers indicated that no major eruptions of this geyser occurred in 1974. Minor eruptions of the two small center vents occurred at less than 3/4 hour intervals. These eruptions are between 7 and 10 feet high and last about 10 minutes. They begin suddenly when the vents overflow. During the eruption the large west vent splashes up about 1 foot.

Trail Geyser: This geyser was named "Trail" on some old pictures which were probably destroyed in the unfortunate fire which consumed the old Shoshone Lake Patrol Cabin at the edge of the basin. The geyser is located near the north end of the basin at the foot of the Sulfur Hills.

The trail passes directly over the crater via a small wooden footbridge. The eruptions occurred at about 15 minute intervals and lasted about 1½ minutes. The eruption was of the splashing type, the height being 3 to 4 feet.

On my August visit a small vent just below the footbridge was also erupting a few inches high at frequent intervals.

Camp Group

The old geyser cone (#6), which has been empty for years, filled to within 3 feet of the top with water this year.

South Group

A new geyser was formed in this group on August 12. It is near the Three Crater Springs and part of the overflow channel from them runs into the crater of the geyser. I don't remember even seeing a crater of that sort there on any previous trips. The crater walls are composed of the jaggedly broken layers of sinter making up the floor of the basin. Fragments of these plates have washed up in a low beach-like ridge around the vent.

The eruptions lasted about 6 minutes and occurred 2 or 3 times per hour. The height of the splashes was about 4 feet.

North Group

Lion Geyser: Old accounts and maps describe this geyser and locate it near Bronze Geyser. Detailed descriptions of its waters can be found in the literature. However, attempts to locate them have been completely fruitless. There are only two geysers in the vicinity of Bronze, neither of which fit the description for Lion. The larger of the two I call "Slot" Geyser because the throat of the geyser is shaped like a slot. I call the smaller one "Little Red".

"Slot" Geyser was irregular and unpredictable, not only in interval but performance. The maximum height varied from 4 to 10 feet and the duration 1 to several minutes.

"Little Red" is nearer the creek and much smaller than "Slot". Its splashes barely reach a foot or two high. Its eruptions are frequent and regular, occurring several times per hour and lasting about 3 minutes.

#31 Geyser: This spring is labeled #31 on the old map of 1878 and its description is given in that report. It is a square-shaped shallow basin lined with small knobs of geyserite. The vent is next to the upslope edge of the bowl and in the middle of that side. Just like so many other geysers in this basin, it is cyclic in operation. At times it can be seen at least three times an hour, while some days no eruptions occur at all. Maximum height was about 7 to 8 feet this year.

"TB" Geyser: This is one of the largest geysers in the Shoshone Geyser Basin and probably the largest west of Shoshone Creek. It is located in the vicinity of Grotto and Pearl Springs near a shallow red algae pool.

Its location on the map is not clear. Its crater is somewhat unusual in shape hence its unusual name. Its operation is fairly recent in origin as evidenced by the disruption of the old sinter laminations near the crater. The deposits within the crater are unusual but typical for its type of eruption. The sinter is deposited in pencil-shaped streamers which parallel the direction of flow during eruption. Similar deposits can be found in the Mortar Geyser (UGB) or in the Monument Geyser Basin cones.

This geyser is also cyclic in operation. This year the active phase was shorter than it was in 1972 and 1973. The active phase normally lasted 1 or 2 days. This year the active phase was about ½ day long and the interval between eruption cycles was at least 2 days. It is evidently inactive for a great deal of the time, because very few people who have visited the basin have told me of seeing it. It was inactive on my June and July visits, but I saw several eruptions on the 12th of August.

In height and appearance it strongly resembles Spectacle in the Upper Geyser Basin. Due to its shallow crater and more direct plumbing, the amount of water suspended in the column is greater than for Spectacle. The height was usually 10 to 12 feet with some bursts reaching over 15 feet high. The style of eruption is more toward the cone type and is angled 30° from the vertical. The duration of the water phase was only 20 seconds and the normal interval was about 14 minutes.

During the active phase the water is in a violent boiling state and surges up from below until the water reaches a level high enough to initiate the eruption. During the active phase a small steam vent near the crater also becomes active and hisses loudly. The crater during the quiet phase is quiescent and the water level fluctuates up and down. I have seen it overflow and ebb without erupting during the quiet phase. It is not known exactly how the eruption cycle is initiated or how far apart these periods are.

No known connections exist with any other features in the area.



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APPENDIX: SUMMARY OF 1974 STATISTICS FOR SHOSHONE GEYSER BASIN

Group	Spring	Data Explanation	Min. Value	Max. Value	Avg. Value	No. Data Pts.	Notes
Orion	Union Geyser	Interval*	---	---	3h07¼m	1	* When active.
"	"	Dur.Prelim.Puffs	---	---	1m47s	1	
"	"	N.cone Dur.water	7m45s	17m00s	12m22½s	2	
"	"	N.cone Dur.steam	2m30s	5m35s	4m02½s	2	
"	"	C.cone Dur.water	---	---	5m43s	1	
"	"	C.cone Dur.steam	---	---	10m05s	1	
"	"	S.cone Duration¢	15m40s	19m30s	17m35s	2	¢ No water phase.
"	"	Dur.Aux.steam ph	4m03s	7m13s	5m38s	2	
"	"	Duration of lull	33s	64s	46s	3	
Minute Man	Minute Man G	Dur.ov.B4 er.	---	---	18m50s	1	
Little Giant	Little Giant Geyser	Duration	6m40s	11m15s	9m47s	6	
" "	"Platform" G	Interval	---	---	39m30s	1	
" "	"	Duration#	1m10s	2m30s	1m50s	2	#Excluding one of
" "	"	Interval$	---	---	13m50s	1	(over 30 min.
" "	Trail Geyser	Dur.ov.B4 er.	---	---	5m50s	1	$Cyclic.
" "	"	Duration	1m15s	1m30s	1m20s	3	
Minute Man South	Twins	Interval	15m00s	16m00s	15m30s	2	
	UNNGN Three Crater	Duration	---	---	60s	1	
North	"Slot" G.	Duration	4m53s	7m03s	5m58s	2	
"	"TB" Geyser	Duration	---	---	1m35s	1	
"	"	Interval@	8s	35s	23.7s	14	
"	"	Dur.quiet ov.	4m33s	18m22s	13m44s	14	@ Cyclic.
			---	---	1m50s	1	