VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS - 1980
U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Formal statements released in 1980
Compiled by Bobbie Myers, 2005

1980

March-April – *formal series begins on April 9*

May – *includes May 18 explosive eruption and May 25 explosive eruption*

June – *includes June 12 explosive eruption with dome growth*

July – *includes July 22 explosive eruption, also includes earthquakes at Mount Hood*

August – *includes August 7 explosive eruption with dome growth*

September –

October – *includes October 16 explosive eruption with dome growth*

November –

December – *includes December 27 dome-building eruption*

MARCH and APRIL 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS

U.S. Geological Survey and University of Washington*
Vancouver and Seattle, Washington
*On April 22 the University of Washington, Seattle, Washington was added to the header

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3/30/80 0500 PDT

The summit was finally visible again last night and a second crater was observed a little after 10:30 PM. The larger one appears to be about 300' x 450' wide, the small is 90' x 150' feet wide. Both are within 60 - 90 feet deep. The two are separated by a 30' bridge.

A blue glow or flame was seen in the smaller one and blue colored lightning was seen arcing between the two craters. According to geologist Bob Christensen this is "not a glow we would associate with the presence of magma".

The flame has not been seen since 11:30 last night, but plumes continue to blast sporadically from the two craters. The highest has risen to 5,000’ above summit or about 15,000' above sea level. Some have been laden with ash; some simply a venting of steam.

In addition to aerial observation, scientists have installed seismic equipment at various places around the mountain, as well as durcos to measure tilting or a change in angle on the mountain slopes.

Visibility has been good on this moonlit night and prospects are good for a clear Sunday to view the mountain.

3/31/80 0500 PDT

There were four significant eruptions yesterday; one at 4:00 am, 8:00 am, 1:00 pm and 2:30 pm. Those between 6:00 pm and 10:30 pm was characterized by periodic gentle eruptions of vapor and steam,

The geologist aboard F.S. aircraft at 10:30 last night observed blue flame in the first crater. This is the first time the flame had been sighted in the larger crater. They were able to observe the flame for about 30 minutes.

A large plume of steam and vapor emitted and rose to an altitude of 12,500' at about 1l:3O pm, but there's been no further significant activity observed since then.

Cloud ceilings started to move down around midnight last night and the observer aircraft returned from the Mt. at about 0300 due to snow flurries. It will probably be airborne again around daylight.

Evidence of the ash from yesterday’s activity occurred almost to Mount Jefferson, approximately 90 miles SE from Mt. St. Helens.

Seismic activity continues at about the same frequency with 6 ground quakes per day registering to 4.0 on the Richter Scale.

A request was made by the Cowlitz and Skamania Co. Sheriff's Offices to the Office of the

Governor for National Guard personnel to help man the roadblocks for Monday. Sheriff's personnel are spread fairly thin. A decision will be made sometime this morning.

Report at 09:00, April 9, 1980

During the past 24 hours intermittent eruptive activity persisted at the vent area near the summit of Mount St. Helens, producing small to moderate explosive emissions of steam and volcanic ash similar to those of the past several days. The longest single episode of nearly continuous volcanic emissions to date was observed yesterday between about 08:22 and 13:59 hours (PST). However, because activity was in progress at both the beginning and the end of the observation period, the eruption lasted for more than 5 1/2 hours. The configuration of the crater area near the summit of the volcano continues to undergo major changes. During the long eruptive episode late yesterday morning, a hole opened in the ice at the head of the Wishbone Glacier, outside the crater, and meltwater from the surrounding ice poured into the hole for several minutes to form a pond. This was followed by the development of cracks through the pond, and an arcuate slice of the upper Wishbone Glacier caved into the crater, enlarging its northwest side by more than 100 m. An especially heavy concentration of dark ash was present in the eruption cloud for several minutes after this collapse of the crater wall.

The pattern of seismic activity continues at about the same levels as it has for the past several days, and the rate of seismic energy release remains about the same. During the time between 09:00 yesterday and 07:00 this morning there were four earthquakes of magnitude greater than 4, occurring at 11:30 and 14:13 yesterday and at 01:01 and 02:13 this morning.

Report at 09:00, April 10, 1980

Eruption continues intermittently from vents near the summit of Mount St. Helens, but observational conditions prevented detailed visual monitoring of the activity during the past day from either the ground or the air. At least three steam and ash eruptions during the day were noted by USGS scientists through sulfur-gas odors and light ash falls in the vicinity of Timberline and Spirit Lake. A recording tiltmeter, installed in the parking lot near Timberline on April 7 has begun to give a continuous record of local ground deformation and is now being compared with other deformation monitors on the north flank of Mount St. Helens. The new tilt data cannot be assessed, however, until a correlation. between the various monitors is established.

Seismic activity continues at a moderate rate, and the number of earthquakes larger than magnitude 3 during the past day was comparable to the average for the previous week. Two short periods of increased local activity of lower magnitudes were reported during the day yesterday from the seismic stations closest to the mountain, but the increased levels persisted only for a few minutes.

Report at 09:00, April 11, 1980

Mount St. Helens continues to erupt intermittently, ejecting columns of volcanic ash and condensing steam. Good weather has returned after several days of poor observational conditions in which relatively few of the eruptions could be observed directly from the ground or the air. Several eruptions were observed during the day yesterday; a moderately explosive event began this morning at 06:12 and continued until 06:58, ejecting large blocks of ice along with the ash and steam. Liquid water continues to be observed at times on the floor of the summit crater. New steam vents were observed yesterday on the northwest flank of the volcano just below the level of the crater rim.

Several monitors of ground deformation on the volcano's north and east flanks have now been measured one or more times, some of them repeatedly over the past two weeks. Measurements of changing acceleration of the earth's local gravity field, precise surveys of ground tilting, and continuous instrumental recording of the tilt all show short episodes of local deformation—as much as a few centimeters of elevation change per kilometer of line length. These changes are episodic over times of several minutes to a few hours and oscillate between uplifts and subsidences, but the net changes over periods of several days are very small. Precise remeasurement of the distance from a point on the east flank of the volcanic cone to another point about 7 kilometers farther east shows no net change in the 7 years since the distance was first measured. Some evidence suggests that the short-period changes are directly associated with individual eruptions, but this correlation is still being tested by further measurements.

Seismic activity remains at a moderate level. Earthquakes of magnitude greater than 4 during the past 24 hours occurred at 13:08, 20:45, and 23:42 yesterday, and at 06:52 this morning. Harmonic tremor beginning at 11:30 yesterday morning lasted for 16 minutes. Earthquakes of magnitudes less than 3 local to the volcano are again at about the same rate as last week after having experienced higher activity levels in clusters during the previous day.

Report at 09:00, April 12, 1980

The eruptive behavior of Mount Saint Helens during the past day has not changed significantly from that of the past 12 days. Since about April 1 the average magnitude and frequency of continuing small to moderate steam and ash eruptions has been essentially constant. Such eruptions typically occur every few hours, produce small eruptive columns, and last for only a few minutes. However, a few each day or two are larger and continue longer--as much as several hours. Although typical eruptions now are about the same size as those of nearly two weeks ago, fewer are visible from distant viewpoints because the summit crater has enlarged and deepened; an eruptive column now must rise nearly 1,000 feet above the crater floor to be visible above the crater rim. The features of the crater change rapidly, with pits on the floor being opened, deepened, or filled during eruptive events, avalanches, and movements on the fractures through the crater system.

Instrumental measurements yesterday confirmed the presence of small amounts of the gas sulfur dioxide in a light plume of vapors that now drifts nearly constantly from the summit region of Mount St. Helens. During the night scientists looked for the blue flame that had been seen in the crater in late March, but none was detected. The frequent presence of liquid water in

the pits on the crater floor may now prevent the burning of volcanic gases to produce the flame. Correlation of data from the various methods used to monitor deformation on the volcano now shows clearly that at least some of the significant short-term changes in tilt and elevation of the ground surface directly reflect individual eruptions. These short-term deformations, however, are not permanent, and no long term tilting has resulted.

Seismic activity also remained relatively constant during the last day. Earthquakes of magnitude 4 or greater occurred at 02:06, 06:52, 10:01, and 15:55 PST, the latter being the largest yet identified, at magnitude 4.9. There were several periods of up to 12 minutes between 14:00 and 17:00 when the seismic station closest to the volcano showed continuous ground shaking related to small earthquakes. There was no harmonic tremor.

Report at 09:00, April 13, 1980

There was less activity in the vent area near the summit of Mount St. Helens during the past 24 hours than had been typical for the past two weeks. Most of the eruptions observed yesterday were small clouds of condensing steam containing little or no visible volcanic ash. A few larger ash-rich eruptions were observed, including one just after dusk that was seen by many people in the Portland-Vancouver area.

Geological Survey scientists working on the north flank of the volcano reported fresh new ground cracks in the area east of Goat Rocks. Instrumental observations of ground deformation indicate a slight amount of inflation or swelling on the north flank near Goat Rocks.

Seismic activity remains moderately high, continuing the pace of the past week. The time of an earthquake of magnitude 4.9 reported yesterday has been corrected to 15:51 on April 11. Earthquakes of magnitude greater than 4 since that time occurred at 21:16 on April 11, and at 07:08, 14:30, 17:30, and 19:03 on April 12. There was a period of harmonic tremor from 14:13 to 14:30 yesterday, ending with an earthquake of magnitude 4.5.

Report at 09:00, April 14, 1980

Intermittent steam and ash eruptions continued at Mount St. Helens during the past 24 hours. Eighteen eruptions ranging in duration from a few minutes to 45 minutes were observed by U.S.G.S. scientists between 5:15 am and 6:30 pm Sunday, April 13. The continuously recording tilt meter installed at Timberline parking lot on April 7th has measured small but consistent changes in ground tilt during the past 72 hours. Both uplifts and subsidences have been recorded. the overall change being a slight subsidence of the central part of the volcano relative to the Timberline instrument station. Two additional tilt meters are being installed at nearby locations to monitor this phenomenon more closely.

Seismic activity continues at a moderate rate. There has been a slight increase in the number of earthquakes larger than magnitude 4 during the last 36 hours. Nine such quakes have occurred in the last 24 hours, the largest a magnitude 4.7 at 5:49 this morning.

Report at 09:00, April 15, 1980

Unfavorable weather conditions during the past 24 hours have hindered visual observations of Mount St. Helens, both from the air and the ground. No eruptions were observed by Geological Survey scientists, and no new ash fell at Timberline on Monday, April 14. If weather permits, a series of observations and measurements will be made tomorrow, including visual observations, gas and ash sampling, and measurements of ground tilt. Data telemetered to Vancouver from the continuously recording tiltmeter at Timberline indicated additional slight subsidence of the central part of the volcano yesterday. Data from a second tiltmeter installed at East Dome on April 13 will be available for analysis beginning tomorrow.

Five earthquakes larger than magnitude 4.0 have occurred during the last 24 hours, at 9:37 am, 4:37 pm, 7:25 pm, and 10:58 pm Monday and at 8:12 am today. There has been a slight decrease in the number of quakes larger than magnitude 3.0 during the last 24 hours, but the rate of seismic energy release remains essentially the same. No harmonic tremor was recorded during the past 24 hours.

Report at 9:00 a.m., April 16, 1980

There has been a decrease in the eruptive and seismic activity at Mount St. Helens during the past 24 hours. The only eruption witnessed by U. S. Geological Survey scientists during this interval occurred at 5:38 a.m. this morning. Data received in Vancouver from tiltmeters at Timberline and East Dome indicate that slight subsidence of the volcano which was reported yesterday has since stopped. There was no net change in ground tilt recorded by either instrument during the past 24 hours.

There was a corresponding small decrease in the rate of earthquakes larger than magnitude 3 yesterday. University of Washington scientists reported five quakes larger than magnitude four during this report period. These occurred at 9:55 a.m. (4.6) and 1:55 p.m. (4.4) Tuesday, April 15, and at 3:47 a.m. (4.0), 7:22 a.m. (4.5), and 7:40 a.m. (4.5) today. There was no harmonic tremor during the report period.

At this time, it is impossible to determine how long the current lull in activity will last. Several teams of U.S. Geological Survey scientists will collect information and samples today in an attempt to further evaluate the status of the volcano.

Report at 9:00 a.m., April 17, 1980

The decrease in both eruptive and seismic activity noted at Mount St. Helens yesterday has continued. At least 9 eruptions occurred during the daylight hours after 09:00 yesterday, and two others were observed early this morning. Most of these, however, were small steam eruptions lasting only about a minute; ash was observed in some but not all of them. There was no change in the instrumentally recorded ground tilt at either the Timberline parking lot or East Dome during the past 24 hours.

Seismic activity also continues to be at a lower level than it was for most of the previous two weeks. Three earthquakes of magnitude greater than 4 occurred during the 24 hours - following 09:00 yesterday, at 20:26 and 23:07 yesterday, and at 04:19 this morning. No episodes of harmonic tremor occurred during that period.

Report at 9:00 a.m., April 18, 1980

Activity at Mount St. Helens exhibits little or no change from the previous day. Frequent small eruptions occurred from the summit crater area during the last 24-hour period; 12 eruptions were observed between about 07:00 and 13:30 yesterday. Viewing conditions deteriorated later in the day, preventing systematic observations. The eruptions were small, mildly explosive emissions of steam and ash. Two of them formed vertical columns about 500 feet above the crater rim, but strong winds generally dispersed the ash-laden clouds into plumes or veils on the north and northeast sides of the volcano.

A gravity survey was completed yesterday, several markers were emplaced near the summit of the volcano, and data on the total amount of ash accumulation were systematically taken. Similar activities will continue today.

Seismic activity continues to decline only slightly. Four earthquakes of magnitude greater than 4 occurred during the past 24 hours (at 09:43, 16:51, and 16:53 yesterday, and at 02:45 this morning). No harmonic tremor was recorded.

Because both eruptive and the seismic activity at Mount St. Helens are now in a rather continuous mode and day-to-day changes are slight, the nature of the resulting immediate hazards remain about the same each day. Other than direct ash falls on the volcanic cone itself, the principal hazard now is from the continued instability of the north flank of the mountain. This instability results from the great amount of ground shaking and avalanching caused by local earthquakes, subsidence of the crater area near the summit, intense fracturing of the ice and rocks on this slope, and locally increased melting that may result from the heating of the volcano and from the dark mantle of volcanic ash that covers much of the snow and ice. Further attempts are now being made to monitor the stability of the north flank and to assess the hazard it presents to the Spirit Lake area and the North Toutle River drainage. Because all pertinent factors seem to remain about the same each day, the daily update represented by this report is no longer needed; the U. S. Geological Survey will henceforth issue these updates twice weekly. The next scheduled release will be on Tuesday, April 22. A report will, however, be issued at any time that new developments indicate a need.

Report at 09:00, Tuesday, April 22, 1980

No daily update on Mount St. Helens' volcanic and seismic activity has been issued by the USGS since Friday, April 18. Our intention to change from a daily to a semiweekly report was found to leave no immediate source of information available to numerous individuals and groups seeking it. Therefore, despite the fact that day-to-day changes generally have been inconsequential, for the immediate future a daily report will again be issued.

Poor weather has made direct observations virtually impossible, from either the air or the ground, during most of the time since the last update was issued. The sparse information available indicates no change in the nature or frequency of eruptive activity, but it is hoped that clearing weather may again provide more regular data. Changes in tilt of the ground surface, now measured instrumentally at three sites around the mountain on the north, east, and south, all show only minor changes. The two stations closest to the center of the volcano show a slight deflation, i.e. the ground has tilted slightly toward the volcano rather than outward, away from it.

A period through Sunday showed slightly greater seismic activity than had occurred since a period of slowly declining activity was noted earlier last week. The number of seismic events greater than magnitude three during each of the three days Thursday (April 17) through Saturday (April 19) was between 44 and 46. The number of events greater than magnitude 3 was slightly up (to 57) on Sunday but was back to 42 yesterday. There were 4 events of magnitude greater than 4 on Thursday, April 17, but there were 8 on Friday, 8 on Saturday, and 7 Sunday. Again yesterday there were 4 quakes larger than magnitude 4. Those on Sunday occurred at 00:08 (magnitude 4.0), 02:25 (4.4), 03:59 (4.0), 09:53 (4.0), 11:21 (4.8), 14:03 (4.4), and 21:18 (4.2). Those yesterday occurred at 07:13 (4.6), 11:52 (4.5), 12:34 (4.0, and 22:11 (4.4).

Report at 09:00, Wednesday, April 23, 1980

Yesterday brought a return of better weather, allowing systematic observations of Mount St. Helens for the first time in nearly 5 days. Most of the reported observations were from the air; ground observations from northwest were poor through most of the day. Eruptive activity appears to be at a low level. The earliest observations yesterday revealed a fresh mantle of snow on the mountain, only a single small area on the west or northwest side having any new ash on top of the snow. The only eruptions reported during the day were small steam blasts, barely clearing the crater rim, during the period between 12:20 and 12:35. No sulfur gases were detected in the vapor plume that accompanied these small eruptions. Continuous steam vents, not associated directly with eruptive activity, were reported by several observers from the eastern part of the summit area.

Instrumental recording of tilt of the ground surface showed small erratic changes that did not define a coherent pattern of surface deformation for the volcano as a whole.

Earthquake activity continues at about the same level as the average for the past week. There were 42 earthquakes during the day yesterday that had magnitudes of 3 or greater. Of these, 5 had magnitudes of 4 or greater, as follows: at 02:25 (magnitude 4.4), 08:36 (4.2), 11:28 (4.5), 14:04 (4.5), and 15:06 (4.1).

Report at 09:00, Thursday, April 24, 1980

After a prolonged period during which systematic observations were lacking at Mount St. Helens because of poor visibility, numerous ground and aerial observations have been made during the past 2 days. No new eruptive activity was observed. The last time that a blanket of new ash resulting from a recent eruption was seen to mantle an area of new snow was on

Tuesday morning; no eruptions large enough to distribute ash outside the summit crater have occurred since then. Fumaroles are now visible in the eastern part of the crater, on both its floor and its south wall. Some chemical sublimates were collected from steaming areas near the summit crater yesterday and will be analyzed as soon as possible.

Photogrammetric measurements made from recently taken vertical aerial photographs of the mountain show that its north flank underwent large bodily displacements at about the time of the first eruptive activity in late March. A pinnacle on the north crater rim now stands 250 feet higher than did the corresponding point before the first eruption; a large bulge at the head of the Forsythe, Leschi, and Loowit Glaciers has been displaced at least 300 feet upwards or outwards (or both) from its former position. Surveying targets were emplaced and measured in a helicopter-supported operation yesterday to help record further displacements on this unstable north flank of the volcano.

Instrumental measurements at the Timberline parking lot above Spirit Lake show slight northwestward tilting of the ground surface; similar measurements show slight southwestward tilts on the east and south sides of the mountain.

Seismic activity continues beneath Mount St. Helens. Yesterday there were 38 earthquakes of magnitude 3 or greater, including 9 of magnitude 4 or greater. The latter occurred at 04:30 (magnitude 4.6) , 07:18 (4.4), 12:15 (4.0), 15:05 (4.1), 16:24 (4.0), 17:45 (4.1), 18:28 (4.1) 20:22 (4.3) and 21:05 (4.1) yesterday.

Report at 09:00, Friday, April 25, 1980

There has been no eruptive activity large enough to expel material outside the summit crater of Mount St. Helens since Tuesday morning. Although observational conditions varied from poor to good through the day yesterday, no eruptive activity was seen and there is no new ash blanketing the most recent snowfalls. Fumaroles continue to produce steam within and near the summit crater.

The instrumentally recorded deformation of the ground surface continues to show only minor net tilting in the immediate vicinity of the volcano; these small tilts do not define a clear pattern of either inflation or deflation of the volcano. Ground surveys to monitor possibly continuing deformation of the volcano's north flank will resume today with helicopter support. These field activities must be completed before there will be enough data to calculate how much, if any, movement is still occurring in that area.

Seismic activity remains at moderate levels. A trend noted for the past four days continues to show a slowly decreasing daily count of earthquakes having magnitudes of 3 or greater, but an increasing proportion of those quakes have magnitudes of 4 or greater. During the 24 hours yesterday there were 36 earthquakes of magnitude 3 or greater, of which 12 had magnitudes of at least 4. These occurred at 01:05 (magnitude 4.4), 02:50 (4.0), 05:32 (4.0), 07:31 (4.0), 09:34 (4.7), 11:00 (4.0), 15:08 (4.3), 16:28 (4.1), 20:55 (4.0), 21:51 (4.1), 22:26 (4.0), and 23:04 (4.0).

Report at 09:00, Saturday, April 26, 1980

Activity at Mount St. Helens remains essentially the same as it has since visibility returned earlier this week. There has been no verified new eruptive activity since Tuesday morning. Steaming fumaroles are now constant on the southeast wall and the floor of the summit crater. The amount of visible fuming varies with the weather and other conditions, but a sudden increase in fuming was observed to coincide with a felt earthquake of magnitude 4.5 at 15:20 yesterday. The amount of $S0_2$ in the emitted gases is about at the level detectible by the instrument being employed. A high concentration of sulphate was found to be present in sublimates collected from the surface two days ago in the vicinity of the summit.

Tiltmeters on the north, east, and south sides of the volcano continue to show only slight surface tilts (a few millimeters of elevation change per kilometer of distance on the ground), and the directions of these tilts change with time in a manner that does not yet define a coherent pattern for the mountain as a whole. The first electronic distance measurements were made yesterday to newly installed survey targets at 5 locations on the upper slopes of the volcano and at two nearby reference points. In order to help monitor deformational changes in the volcano, these distances and comparable angular measurements will be remeasured in the next few days. In addition, a set of photogrammetric markers were installed on the mountain by helicopter yesterday to aid in monitoring its surface, including the prominent bulge on the north flank.

Seismic activity continues in the same pattern as it has for many days. There were 34 earthquakes of magnitudes larger than 3, of which 7 were larger than 4. Those greater than 4 occurred at 03:00 (magnitude 4.1), 3:03 (4.0), 05:50 (4.0), 10:16 (4.0), 15:20 (4.5), 18:24 (4.3), and 20:11 (4.4).

Report at 09:00, Sunday, April 27, 1980

Summit activity at Mount St. Helens continues at a low level. Fumaroles within the summit crater emit steam more or less continuously, but eruptive bursts of ash and steam are too small to eject material outside the crater. Visibility continues good today, and aerial observation is scheduled.

Tiltmeters on the east and south flanks of the volcano continue to show only very slight nonsystematic changes. Ground deformation measured at Timberline, however, has shown a progressively increasing northward tilt for the last two days.

There were 30 earthquakes yesterday having magnitudes of 3 or greater, 6 of them having magnitudes of 4 or greater. The latter occurred at 04:17 (magnitude 4.1), 06:26 (4.2), 07:54 (4.1), 17:15 (4.5), 18:00 (4.0), and 23:26 (4.7).

Report at 09:00, Monday, April 28, 1980

In terms of visible eruptive activity there have been no significant changes at Mount Saint Helens in nearly a week. Fumaroles remain active in the summit crater, and one fumarole on the southeast crater wall is particularly active. No ash eruptions were reported throughout the period of good visibility and nearly continuous observations that lasted from late Thursday through last night. It appears that eruptive bursts of ash and steam have been replaced by a nearly constant

release of steam from the summit crater region.

Despite the lack of visible day-to-day changes, active deformation on the north flank of Mount St. Helens continues at an impressive rate. Ground tilt measured near the Timberline viewpoint has changed since about noon on Friday from a moderate tilt downward to the north to a high rate of tilt downwards toward the northeast. Although this tilt now is in a direction consistent with inflation of the volcano, it might equally well reflect movement of the entire north flank of the volcano resulting from its gravitational instability. In addition, precise surveying of various points on the north flank from Timberline indicates that an area in the immediate vicinity of Goat Rocks has moved outwards, away from the main mass of the mountain, at least 15-20 feet in the last 4 days. Data collected in the past few days are now being analyzed to better define the pattern of deformation on the north flank, and further measurements are continuing.

Seismicity continues beneath the volcano. The daily count of earthquakes having magnitudes of 3 or greater was 36 yesterday, higher than on any previous day since Thursday of last week. Seven earthquakes having magnitudes greater than 4 occurred yesterday at the following times: 04:34 (magnitude 4.0), 06:48 (4.3), 09:04 (4.0), 12:54 (4.0), 15:40 (4.0), 19:49 (4. 8), and 21:16 (4.4).

Report at 09:00, Tuesday, April 29, 1980

After several days of good weather, visibility was again hampered yesterday for much of the day. Intermittent observations indicate no change in the pattern of vent activity characterizing Mount St. Helens; there have been no recent eruptions large enough to eject ash from the summit crater but steam emission is nearly continuous, punctuated by occasional episodes of more intense steaming.

No new measurements were made yesterday of the large-scale ground deformation that has occurred on the north flank of the volcano, but a set of new measurements will be made today. A recording tiltmeter at Timberline, on the north flank, still shows small changes, indicating that some deformation continues.

Seismicity levels remained about the same as for the previous week. Of the 34 earthquakes that were recorded yesterday as having magnitudes of 3 or greater, the 10 largest had magnitudes between 4.0 and 4.6.

Report at 09:00, Wednesday, April 30, 1980

Detailed photogrammetric measurements of aerial photographs have revealed that the uplift on the north side of Mount St. Helens extends over an area which is about a mile long and 0.6 mile wide. The axis of this elongate area trends northeasterly from the north side of the summit crater toward Sugar Bowl. The uplift reaches a maximum amount of about 320 feet and decreases toward the east, north, and west. Toward the south, it intersects the north rim of the crater.

Ground surveys April 29 showed that deformation of the north flank of the volcano is

continuing. Between April 27 and 29, Goat Rocks shifted about 9 feet in a north-northwest direction. This sideways shift was accompanied by little or no vertical movement. Goat Rocks is on the northwest flank of the uplifted area, but the relation of the sideways shift to the uplift is not yet fully understood.

The tiltmeter at Timberline, on the north side of the volcano, showed a small amount of tilt downward toward the north on April 29, and the tiltmeter at Ape Cave, south of the volcano. showed a small but consistent tilt away from the volcano. No eruptive activity has been reported during the last 24 hours.

There were 30 earthquakes at Mount St. Helens with magnitudes of 3 or greater during the 24-hour period preceding 05:30 a.m. April 30. Five of these had magnitudes of 4 or greater, the strongest of which had a magnitude of 4.7.

MAY 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS

U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 9:00, Thursday, May 1, 1980

The principal activity at Mount St. Helens continues to be displacement of its north flank. Geodetic measurements were again made yesterday, and a new survey target was installed near the highest part of the prominent bulge that has formed on the upper north slope of the mountain since seismic and volcanic activity began in late March. Large lateral displacements are still occurring; the Goat Rocks area moved 5 feet north-northwestward during the single day between Tuesday and Wednesday. Cumulative movement of a few inches since the precise ground-based measurements began last week has now been detected near the Sugarbowl and Dogs Head, other prominences near the base of the bulge. The net tilt measured at Timberline, below the visible bulge, during the period from April 12 to April 30 was about 29 microradians to the north-northeast (a microradian is the angle formed by a line 1 kilometer—0.6 miles—long that is lifted 1 millimeter—0.04 of an inch—at one end). During the shorter period April 25-30, the net tilt at Timberline was about 11 microradians to the north.

Fumaroles continue to be active within the summit crater. The site of one of the most active fumaroles in the eastern part of the crater last week has been drowned by a small lake with gas bubbling through its surface. Steaming ground pervades the north crater wall near this lake, and the most active fumaroles now are on the south wall above the lake. No eruptions occurred during the day yesterday.

There were fewer large-magnitude earthquakes (22 greater than magnitude 3) yesterday than for any day during the previous month. Of these earthquakes, 6 had magnitudes greater than 4, occurring at 00:42 (magnitude 4.4), 08:08 (4.0), 13:51 (4.2), 21:46 (4.1), 21:53 (4.0), and 23:12 (4.0).

Report at 09:00, Friday, May 2, 1980

Activity at Mount St. Helens remains in the same mode it has since Tuesday, April 22. Since that time there have been no eruptions, but fumaroles have been active in the summit crater. Large deformations continue to occur on the north flank; points like Goat Rocks and the Sugarbowl, at mid-levels on that flank, continue to show significant displacements away from the center of the volcano. The first remeasurement of a recently installed survey marker near the highest point on the bulging north flank showed that it had moved more than 60 centimeters (about 2 feet) in less than 12 hours since its position was first measured. Further calculations will show whether the upper part of the bulge continues to move upward or, like points lower on the mountain, is now moving mainly laterally.

Seismicity remains high, and yesterday's count of 34 earthquakes having magnitudes of 3

or greater was again near previous levels after a lower count on the previous day. Of these 34 earthquakes, 5 had magnitudes of 4 or greater, the largest a magnitude 4.6 event at 12:27 in the early afternoon.

Report at 09:00, Sunday, May 4, 1980
For events from midnight May 2 to midnight May 3

In order to simplify the preparation of these daily updates and to make them more easily understandable, they will henceforth be given in a standard outline form, as follows:

ERUPTIONS: None

OTHER EMISSIONS: Fumaroles in summit crater.

DEFORMATION: Deformation of the north flank continues at very high rates. Continued measurements show that high points near the north rim of the crater and points as low as Goat Rocks are moving northward as much as 5-6 feet per day.

SEISMICITY:

Events of magnitude 3 or greater:	26
Events of magnitude 4 or greater:	5 (also included in category above)
Largest event:	M 4.4, at 06:17
Harmonic tremor:	none

OTHER COMMENTS: Viewing conditions were good and steam venting continued in the summit crater, but there were no explosive eruptions. Further monitoring of the bulging north flank of the volcano will be done during the day today.

Report at 09:00, Monday, May 5, 1980
For events from midnight May 3 to midnight May 4

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: None

OTHER EMISSIONS: Fumaroles in summit crater; the largest fumarole on the south wall of the crater appeared to be less vigorous than it had in recent days.

DEFORMATION: Deformation of the north flank continues at very high rates. A sequence of measurements was made repeatedly yesterday between Goat Rocks and a point about 5 miles to the north, showing that Goat Rocks moved at a nearly constant rate throughout the day. The rate

of movement is still about 4-5 feet per day.

SEISMICITY:

Events of magnitude 3 or greater:	31
Events of magnitude 4 or greater:	8 (also included in category above)
Largest event:	M 4.8, at 22:43
Harmonic tremor:	none

OTHER COMMENTS: It is now clear that the bulging north flank of Mount St. Helens resulted from a magmatic intrusion to some level within the volcano during late March. It remains uncertain whether that intrusion is still active or whether the present deformation results from the gravitational spreading of the mountain. The frequently repeated measurements now being made should eventually allow us to determine whether intrusion of magma to shallower levels is still occurring; information now available still allows that possibility.

Report at 09:00, Tuesday, May 6, 1980
For events from midnight May 4 to midnight May 5

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: None.

OTHER EMISSIONS: There was continuous but no significant new fumarolic activity in the summit crater.

DEFORMATION: No measurements of deformation of the north flank were made yesterday. New measurements to monitor that flank will be made today. Small but insignificant tilts were detected at stations on the east and south flanks of the volcano.

SEISMICITY:

Events of magnitude 3 or greater:	26
Events of magnitude 4 or greater:	6 (also included in category above)
Largest event:	M 4.5, at 02:13
Harmonic tremor:	none

OTHER COMMENTS: Slash burning led to many erroneous reports of lava flow eruptions during the afternoon of May 5, but there were no lava flows.

Report at 09:00, Wednesday, May 7, 1980
For events from midnight May 5 to midnight May 6

In order to simplify the preparation of these daily updates and to make them more easily

understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: None known; summit was obscured during most of the day.

OTHER EMISSIONS: None known; summit crater was not observed.

DEFORMATION: Measurements on May 6 show that the north flank is continuing to move outward to the north at the same rate of about 4-5 feet per day. Slight tilting down to the southwest was detected on the east and south flanks of the volcano.

SEISMICITY:

Events of magnitude 3 or greater:	36
Events of magnitude 4 or greater:	6 (also included in category above)
Largest event:	M 4.7, at 10:05
Harmonic tremor:	none

OTHER COMMENTS: A recent thermal infrared survey made for the U.S. Geological Survey by personnel of Attack Squadron 128 based at the Whidbey Island Naval Air Station detected a small previously unknown area of warm rock on the north slope of the volcano. This warm area may have existed before the survey but been covered by ice or it could mark a increase in heat flow at that point.

The warm ground is approximately 100 feet long and 50 feet wide, in the middle of the bulge on the N.E. flank of Mt. St. Helens, in an area of increasing ice break-up.

Report at 09:00, Thursday, May 8, 1980
For events from midnight May 6 to midnight May 7

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: There were three steam and ash eruptions late in the day, the first from 5:57 to 6:10 p.m., the second from 6:23 to 6:30, and the third from 10:26 to 11:36 p.m. Plumes rose to as much as 13,000 feet above sea level, and drifted generally northward. Three smaller steam plumes were seen between the second and third ash-bearing eruptions. These steam and ash eruptions were similar to those of early and mid-April, and no glow or other evidence of magma at the surface was observed.

OTHER EMISSIONS: Steam emission from two sites on the Boot high on the north flank, and from a crevasse at the head of Shoestring Glacier in the eastern part of the summit area was much more noticeable because of weather conditions but not necessarily stronger than at previous times.

DEFORMATION: Measurements on May 7 show that the north flank is continuing to move

outward to the north at the same rate of about 4-5 feet per day.

SEISMICITY:

Events of magnitude 3 or greater:	27
Events of magnitude 4 or greater:	6 (also included in category above)
Largest event:	M 4.6, at 04:09 a.m.
Harmonic tremor:	none

OTHER COMMENTS: Helicopter flights are planned today to assess changes that may have occurred on the potentially unstable north flank of the volcano as a result of renewal of eruptive activity.

Report at 09:00, Friday, May 9, 1980
For events from midnight May 7 to midnight May 8

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: Steam and ash eruptions continued sporadically through at least the daylight hours. Limited and intermittent visibility prevented determination of the specific number and duration of eruptions, and height of plumes. Ash was distributed mainly north and east; muddy rain fell at the Timberline monitoring site.

OTHER EMISSIONS: There is continued steaming from the main crater, the Boot high on the north flank, and in the summit area at the head of the Shoestring Glacier. Sulfur emission has increased somewhat with the new eruptive activity, but is still low compared to various kinds of industrial emission levels.

DEFORMATION: Measurements on May 8 again showed continued movement outward to the north of the north flank of the volcano.

SEISMICITY:

Events of magnitude 3 or greater:	25
Events of magnitude 4 or greate:	11 (also included in category above)
Largest event:	M 5.0 at 00:49 a.m.
Harmonic tremor:	two periods, 04:43 to 05:03 10:04 to 10:13

OTHER COMMENTS: None

Report at 09:00, Saturday May 10, 1980
For events from midnight May 8 to midnight May 9

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: Steam and ash eruptions occurred sporadically throughout the day. Limited and intermittent visibility prevented determination of the specific number and duration of eruptions, and heights of plumes.

OTHER EMISSIONS: There is continued steaming from the main crater, the Boot high on the north flank, and in the summit area at the head of the Shoestring Glacier.

DEFORMATION: Measurements on May 9 again showed continued movement outward to the north of the north flank of the volcano.

SEISMICITY:

Events of magnitude 3 or greater:	27
Events of magnitude 4 or greater:	10 (also included in category above)
Largest event:	M 4.9 at 00:01
Harmonic tremor:	none

OTHER COMMENTS: None

Report at 09:00, Sunday, May 11, 1980
For events from midnight May 9 to midnight May 10

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: Steam and ash eruptions were observed frequently during Saturday; the volcano, however, was not visible during much of the day.

OTHER EMISSIONS: No new areas of steaming were observed.

DEFORMATION: Measurement on Saturday of a limited number of targets during marginal weather conditions suggests that movement of the north flank has slowed to less than half of its average rate of the last two weeks. Deformation measurements will be made again today. Tilt stations on both the north and south sides of the volcano show slight but consistent overall inflation of the volcano over the past month.

SEISMICITY:

Events of magnitude 3 or greater:	24
Events of magnitude 4 or greater:	10 (also included in category above)
Largest event:	M 4.6 at 21:00
Harmonic tremor:	none

OTHER COMMENTS: None

Report at 09:00, Monday, May 12, 1980
For events from midnight May 10 to midnight May 11

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: Eruptive bursts of steam and ash were frequent throughout Sunday; some plumes rose only to about the crater rim, but many rose to 1,000 - 2,000 feet above the rim. Ash was carried for at least a few miles west and south of the volcano.

OTHER EMISSIONS: One site high on the north side ceased obvious steaming, but a second steaming site was observed in the summit area at the head of Shoestring Glacier.

DEFORMATION: Measurements on Sunday indicated resumption of northward movement of the north flank of the volcano at about the same rate as the previous two weeks. The brief indication of a lower rate of movement reported yesterday results in a slightly lesser overall deformation rate for the north slope. Measurements of deformation will be continued today. The tiltmeter on the north flank continues to show slight tilt in the inflationary direction; those on the east and south sides show no significant inflationary or deflationary tilt.

SEISMICITY:

Events of magnitude 3 or greater:	22
Events of magnitude 4 or greater:	10 (also included in category above)
Largest event:	M 4.5 at 06:30
	15:46
Harmonic tremor:	none

OTHER COMMENTS: Beginning today, a geologist will be available by telephone only from 9-11 a.m. and from 3-5 p.m. to briefly describe or explain the Mount St. Helens volcanic activity. Because of workload, we cannot at the present time provide that service at other times of day.

Report at 09:00, Tuesday, May 13, 1980
For events from midnight May 11 to midnight May 12

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: Continuous observation from 11 a.m. to 1 p.m. and intermittently at other times indicate that steam and ash eruptions are continuing, and are comparable to those of the previous

few days and of early to mid-April.

OTHER EMISSIONS: A small cluster of new fumaroles was observed on the west rim of the crater.

DEFORMATION: Measurements made on Monday confirm that the northerly movement of the north flank of the volcano continues at approximately the 5 foot per day rate of the last 3 weeks. Tilt results remain the same, with slight tilt in the inflationary direction shown by the north flank instrument, but no significant inflationary or deflationary tilt shown by stations on the east or south side.

SEISMICITY:

Events of magnitude 3 or greater:	40
Events of magnitude 4 or greater:	10 (also included in category above)
Largest event:	M 5.0 at 09:26
Harmonic tremor:	none

OTHER COMMENTS: We will continue to have a geologist available by telephone only between 9 and 11 a.m. and 3 and 5 p.m. to answer questions regarding the volcanic activity.

Report at 09:00, Wednesday, May 14, 1980
For events from midnight May 12 to midnight May 13

In order to simplify the preparation of these daily updates and to make them more easily understandable, they are now given in a standard outline form, as follows:

ERUPTIONS: Steam and ash eruptions like those of the previous few days were observed during the morning. Activity was less frequent during the afternoon; no eruptions were seen during a period of more than an hour of aerial observation in the afternoon.

OTHER EMISSIONS: The pit in the ice at the principal steaming site at the head of the Shoestring Glacier has enlarged somewhat and visible steam emission has increased.

DEFORMATION: No new measurements of deformation of the north flank were made on Tuesday. No significant changes in tilt were observed.

SEISMICITY:

Events of magnitude 3 or greater:	23
Events of magnitude 4 or greater:	6 (also included in category above)
Largest event:	M 4.6 at 19:19
Harmonic tremor:	none

OTHER COMMENTS: Yellowish green encrustations on old ash were visible on the upper south slope of the volcano yesterday. These probably are water-soluble compounds that could

have been derived from erupted steam or leached from the ash, and would be similar to other encrustations that have been observed within the crater and on the crater rim during the last month.

We will continue to have a geologist available by telephone only between 9 and 11 a.m. and 3 and 5 p.m. to answer questions regarding the volcanic activity.

Report at 09:00, Thursday, May 15, 1980
For events from midnight May 13 to midnight May 14

ERUPTIONS: Steam and ash eruptions similar to those of the last few days were observed intermittently through the day, although the volcano was seen less than 50 percent of the time because of bad weather.

OTHER EMISSIONS: The most accurate measurements thus far of the $S0_2$ content of gas emitted from the volcano were obtained; they indicate a rate of emission of 10-20 metric tons per day of $S0_2$ during eruptive pulses, and about one ton per day between those pulses. These rates are not significantly different from those obtained during March and April. These emission rates are low compared to emissions from industrial sources, which may be 10 to 100 times higher.

DEFORMATION: Measurements of north flank were made again on Wednesday, and show that movement of that flank continues at the same rate of about 5 feet per day that has been noted for the past 3 weeks. No significant changes in tilt were observed.

SEISMICITY:

Events of magnitude 3 or greater:	27
Events of magnitude 4 or greater:	8 (also included in category above)
Largest event:	M 4.4 at 02:44
Harmonic tremor:	none

OTHER COMMENTS: A small new steaming vent was active yesterday between the two small peaks on and just north of the north crater rim.

Report at 09:00, Friday, May 16, 1980
For events from midnight May 14 to midnight May 15

ERUPTIONS: Because of poor visibility, observations of the volcano were not continuous yesterday; no eruptions were seen, either from the ground or the air. During periods when visibility was clear, no eruptions occurred and the summit vents were seen to have been partly filled by fallen blocks of ice.

OTHER EMISSIONS: Poor weather also hampered measurement of the sulfur-dioxide content

of gases emitted from the volcano, and no significant new information on $S0_2$ was obtained despite attempts to make such measurements from the air.

DEFORMATION: Measurements of surface deformation on the north flank were again made yesterday. They show that north northwestward movement of the Goat Rocks area continues at the same rate of about 5 feet per day. Changes in tilt near the base of the mountain were slight.

SEISMICITY:
Events of magnitude 3 or greater: 40
Events of magnitude 4 or greater: 9 (also included in category above)
Largest event: M 4.8 at 04:42
Harmonic tremor: none

OTHER COMMENTS: By the time it was reobserved yesterday, the small steaming vent first seen on Wednesday between the two small peaks just north of the north crater rim had been filled in by fallen ice.

Report at 09:00, Saturday, May 17, 1980
For events from midnight May 15 to midnight May 16

ERUPTIONS: No eruptions have occurred at Mount St. Helens since Wednesday, May 14. Visibility yesterday was good for aerial observations although intermittent cloud cover interfered with ground-based observations of the summit area during much of the day.

OTHER EMISSIONS: Steaming continues from the summit area. The principal steam vents are a large fumarole on the south wall of the summit crater and a continually enlarging pit on the upper Shoestring Glacier, just south of the crater. Other steaming areas occur on the bulging north flank of the mountain, particularly near the highest points of the bulge. Measured emissions of $S0_2$ yesterday were slight.

DEFORMATION: Continued monitoring of surface deformation was supported by helicopter yesterday and will be again today. The results show a continuation of trends reported previously, but the reporting of specific results must await further calculations on the data now being obtained.

SEISMICITY:
Events of magnitude 3 or greater: 26
Events of magnitude 4 or greater: 5 (also included in category above)
Largest event: M 4.4 at 19:36
Harmonic tremor: none

OTHER COMMENTS: The appearance of the upper part of the volcanic cone has changed since the resumption and subsequent recession of volcanic activity in the past week and a half. In particular, old fractures and disturbed segments of the north and west rims of the summit crater

have been partly filled in by snow and drifted volcanic ash; this area appears to be moving downward as a coherent block toward the crater. By contrast, the actively bulging main part of the north flank remains highly broken and distorted at the surface, indicating continued internal deformation as well as outward displacement of that part of the cone.

Sunday, May 18
No written update issued

Report at 09:00, Monday, May 19, 1980
For events from *(blank on copy of original—may not have been officially released as indicated by May 20 update)*

ERUPTIONS: Activity decreased during the night on the volcano. Tracked by radar observations, some slight increase in eruptive activity occurred this morning. Low seismicity with low level harmonic tremor with some infrequent minor earthquakes. The center of the earthquakes is believed to be at 10-20 km depth which is significantly lower than the quakes reported yesterday.

At present time geologist from U.S. Geological Survey and University of Washington are studying the seismological records from May 18th. Some seismometers and tilt meters are still relaying information from near Mount St. Helens. Geologists are mapping the devastated area around the volcano to get an idea for the intensity of the initial blast. Studies of the ash deposits and extent are being made.

Additional evidence from radar observation indicate Spirit Lake is either totally covered or filled in by a volcanic deposit.

Height of plumes during night was 5,000 to 10,000 ft. Just after 6:00 a.m. May 19 the plume was tracked to reach 11,000 ft.

Pyroclastic flows continued down the mountain but at times during the night pyroclastic flows did not come down the flanks of the mountain.

No glows were observed during the night on the volcano which was continually monitored.

Mudflows are continuing in the valleys, particularly the North Fork of the Toutle River but others are reported from South Fork Toutle and Pine Creek drainages.

Crater shape suggests activity will continue at least on the north side of Mt. St. Helens.

Joe Rosenbaum with the U. S. Geological Survey flew in the vicinity of the crater early this

morning, and described the crater of Mount St. Helens as "an incredible hole". No depth has been measured though scientists report a deep crater has formed with numerous jets of steam emitted from the hole. The crater is in the shape of a horseshoe with a flat rim, breached on the northwest flank. at the location of the former bulge.

An amphitheater-like area now replaces the region of the bulge.

Toutle River at Castle Rock peaked at 23 feet. Estimate peak 115,000 cfs. Almost three times the previous record of 1977 flood.
Cowlitz 123,000 cfs river stage was 29.5 ft.

Report at 09:00, Tuesday, May 20, 1980

This is the first update of this series to be released since Saturday, May 17. The major eruption of Mount St. Helens that began at 08:32 on Sunday May 18 continues at this time although at a much reduced rate.

The first systematic close-in observations were made during the day yesterday, revealing that the initial eruptive event consisted of three components. The first was an initial blast that totally devastated the forest over a wide swath arcing from the northwest to the north or northeast side of the volcano and extending up to 15 miles from its former summit. The blast covered the devastated area with ash that swept the ridges, collected in valleys, and flowed down the local drainages. Although the blast was hot, its temperature was not high enough to char the fallen or buried trees. The second component of the event was a combined pyroclastic flow and landslide that carried material released by catastrophic failure of the volcano's north flank across its lower slope and about 18 miles down the Toutle River Valley, burying it to depths as great as 200 feet. The third component was a pumiceous pyroclastic flow that funneled northward through the breach in the crater formed by the north-slope failure. This deposit raised the outlet of Spirit Lake by about 200 feet and raised the water level by 100-150 feet. The lake continues to rise behind the debris dam.

After the initial rapid series of events, the volcano continued to erupt an ash column to altitudes of 50,000 to 60,000 feet and greater for several hours, generating a plume at high levels in the atmosphere that has deposited ash more than several inches thick as far east as central Montana and continues to deposit detectable amounts of ash into the central United States.

The volcanic edifice has been greatly modified as a result of the initial eruptive events. The crater is greatly enlarged to envelop the entire previous summit area. The north flank of the volcano, which had bulged at very high rates for over a month, was completely removed, opening the crater on its north side to an elevation of about 4,400 feet, nearly to the base of the cone on its north side.

The pace of the eruption has slowed considerably. By late Sunday there were intermittent periods during which the ash column rose only a few thousand feet above the crater rim, bursting at times to altitudes of 15,000-18,000 feet. By yesterday, the ash column generally rose no higher that a few hundred to a few thousand feet, and by last night there were times when the column appeared to consist more of condensed steam than of ash. By early this morning, much of the rising column appeared to be mostly white steam condensate.

The eruption appears to have been triggered by an earthquake of about magnitude 5. The rate of seismic activity rose rapidly, and all remaining instruments in the seismic network were saturated by continuous ground movements during the main phase of ash emission. Activity levels gradually diminished; during the 24 hours from midnight to midnight yesterday there were only three earthquakes having of magnitudes greater than 3. The earthquakes now are mainly from depths of 15-30 miles; those that preceded the major eruption were mainly from depths of eight miles or less.

Both the initial blast and the subsequent mudflows and floods down the Toutle River caused heavy damage and numerous casualties. The most important remaining hazard results from the debris dam at Spirit Lake which could be breached by the rising water. Rapid release of this water could cause even larger floods down the Toutle River, and the saturated debris filling the upper part of the valley could generate large mudflows farther down the valley.

Report at 09:00, Wednesday, May 21, 1980

Eruptive and seismic activity have continued to decline at Mount St. Helens, following the trend reported yesterday morning. Eruptive activity at the crater vent is now sporadic, and much of the emission appears to be condensed steam. It appears that the debris flow that rushed down the drainage of the North Toutle River on Sunday morning, immediately after the initial northward-directed blast, was relatively cool. It probably represents the remnant of the volcano's north flank that disappeared after the blast; the sporadic warm areas in it probably represent warmer parts of the volcano's interior before its disruption. This debris-flow deposit also contains blocks of ice from the north-flank glaciers that disappeared with that part of the volcano; some of the blocks have melted in place and leave holes in the hummocky surface of the debris-flow.

Temperatures were measured in secondary pyroclastic flows that formed from the ash of the initial blast deposit and are now as high as 147^{o}C at depths of about 2 feet. The large fumaroles and secondary explosions that have disrupted the debris flow and younger pumiceous pyroclastic flows in the upper drainage of the North Toutle River may have their heat source in the hot ash of the initial blast deposit.

Seismicity has declined dramatically and is lower than at any time since March 22. There have been no earthquakes of magnitudes greater than 3 since 07:22 on Monday morning. All of the earthquakes of magnitudes greater than 1.5 are now occurring from depths greater than 10 km.

The principal immediate hazard potential remains the possible overflow of Spirit Lake, which could cause further mudflows and flooding the valley of the North Toutle. The best data available from observations and from radar imagery, although they are incomplete, do not suggest that the lake level is rising rapidly.

Report at 09:00, Thursday, May 22, 1980

Eruptive and seismic activity at Mount St. Helens continued at about the same level as was

reported yesterday morning. Although the mountain was obscured by clouds most of the day, scattered observations indicate that the crater vent continued to erupt sporadic plumes of steam.

Observations of Spirit Lake from both the air and ground indicate that the level of the lake is 150 feet below the top of the debris flow which fills the upper part of the North Toutle drainage. The lake level was equal to or slightly below the level observed on Tuesday. Markers were placed at and above the present lake shore for the purpose of accurately monitoring the level at the lake in the future.

Observations of the level of the lake and the nature of the debris flow in the upper part of the North fork of the Toutle River, suggest that the immediate danger of the overflow of Spirit Lake, or of large-scale mudflows or floods down the North Fork of the Toutle River may be less than previously thought but observations are continuing.

Seismicity remained at a low level similar to that during the last several days. There were two earthquakes of magnitude greater than 3 and none greater magnitude 4. Tiltmeters operating on the south side of the mountain showed no significant changes.

Report at 09:00, Friday, May 23, 1980

The eruptive activity at Mount St. Helens has begun to show a rather steady pattern. Steam eruptions from the central crater of the volcano are now frequent or nearly continuous, but there have been few significant emissions of ash for several days. The height of the eruptive column at this time varies mainly with weather conditions, tending to rise to its greatest heights (15,000 to 18,000 feet above sea level) when the wind is lightest. Close-in observations from a helicopter indicate that the steam is emitted in vigorous jets from many vents within the central crater of the volcano, beneath its former summit. The vents appear to occur within a ring around the outer part of this deepest part of the crater complex.

The eruptive column is generally light in color. The material emitted appears to be mainly steam, which condenses in the air to make the column visible, and hydrogen sulfide (H_2S), the sulfur gas with a familiar "rotten eggs" smell. Reports of the presence of this gas in amounts detectable to the nose are more common since the ash-rich part of the eruption subsided on Monday. Although the gas is detectable both by aerial observers close to the volcano and by ground parties at greater distances, there appear to be no dangerously high concentrations of H_2S.

A new study is underway to determine the stability of the debris-flow fill in the North Toutle valley and to evaluate the further possible hazard it may present for mudflows or floods downriver. At present the situation in the Toutle valley seems stable.

Earthquake activity continues at a low level. The earthquakes beneath Mount St. Helens are from deeper sources, 6-12 miles, than before the Sunday eruption. Some earthquakes, too small to be felt, have occurred to the northeast of the volcano during the last day; these appear to represent regional seismicity of the type that was common before the eruptive and seismic activity of March to May.

Report at 09:00, Saturday, May 24, 1980

The situation at Mount St. Helens remains substantially unchanged today. The volcano continues to discharge steam and other gases from a group of jetting vents within its central crater. A column of condensing steam that rises from the crater varies in height with the amount of steam emitted and with the strength and direction of the winds, which are now blowing the column to the southeast and south. The odor of H_2S is still noticeable at places within and near the column.

During one short period of intense steam emission this morning the column discharged ash to a height of about 500 feet above the crater rim; this ash appears to represent pulverized rock debris that periodically avalanches into the crater from its steep inner walls and is not evidence of renewed magmatic eruption. There are also occasional explosions outside the crater in the area that was blanketed by hot ash last Sunday and Monday. These steam explosions, caused by groundwater in contact with the hot ash below the surface, sometimes erupt through the surface materials to throw ash into the air.

Newly acquired chemical data indicates that the pumice and glassy ash erupted since last Sunday has the composition of dacite, a type of magma that has a moderately high content of $Si0_2$ and is generally quite viscous.

Seismic activity continues to be at a level much below that of the two months before last Sunday morning's eruption. No earthquakes of magnitudes greater than 3 have occurred since last Thursday.

Report at 09:00, Monday, May 26, 1980

Yesterday, a week after its major explosive eruption of May 18, Mount St. Helens again erupted significant quantities of ash and dispersed them over wide areas of Washington and Oregon.

Beginning at 02:32, an increase in the amplitude of volcanic tremor was recorded on the seismic network around the volcano. Within minutes the surveillance aircraft reported an ash-rich eruption column, which by 02:39 had reached a height of 24,000 feet above sea level and was mushrooming at the top. By 02:45, the National Weather Service radar at Portland reported the column to have reached an altitude of about 45,000 feet. A swarm of small earthquakes began at 02:49, occurring at a rate of 1-2 per hour about 5 miles beneath the volcanic cone.

The eruption continued throughout the day. The density of ash in the eruption column began to decrease within 5 minutes, and the height of the column began to decrease in the first hour. Most of the day it varied between about 13,000 and 20,000 feet above sea level. Winds at these levels were highly variable throughout the day, dispersing ash at different times to nearly every direction except the northeast. By 06:00, ash was falling in the Portland-Vancouver area, but shifting winds soon carried most of the ash to the northwest. Darkness overtook the cities of Kelso and Longview, and the ash plume extended as far as the Olympic Peninsula. Power and telephone failures were common as the ash weighted wires and tree branches and interfered with transformers. By late morning and through the evening ash transport from the volcano was again mainly to the southwest, south, and southeast. Most airports in southwestern Washington and northwestern Oregon were closed at various times. The Portland airport remained closed most of the day.

By 08:00 the intensity of volcanic tremor had diminished and the earthquake swarm had

begun to subside. Eruptive activity varied in intensity but did not stop during the day. By early evening, the height of the eruption column, as determined on weather radar, was only a few thousand feet above Mount St. Helens' crater rim, and by about 01:00 this morning the volcano again appeared to be normal.

Aerial surveillance was continuous through most of the activity, but was severely hampered by late afternoon and was finally curtailed by airport closures. Rain continued and visibility was poor all day. At only one time was the volcanic cone itself seen from the air, revealing the eruptive vent to be in the northeastern part of the crater. A small mudflow descended south of the Shoestring Glacier on the southeast side of the volcano but did not extend beyond the base of the cone.

The intensity of the earthquake swarm began to decrease by about 08:00, and the level of tremor has remained low since then, with only brief intervals of increased amplitude. The tiltmeters south of the volcano showed no change before, during, or after the eruption.

(The daily update report was not issued yesterday.)

Report at 09:00, Tuesday, May 27, 1980

After a day of continuous ash emission last Sunday, May 25, Mount St. Helens seems to have returned yesterday to the mode of eruption that it has exhibited much of the time since the decline of the eruption on May 18 and 19.

Poor weather and some residual ash in the air from the previous day's eruption kept most aerial observers on the ground until last night. Sporadic visual reports and weather-radar observations indicate that a column of steam probably is now being emitted nearly continuously from vents in the central crater of the volcano; this column entrains varying amounts of ash from time to time.

Round-the-clock surveillance flights have now resumed, and helicopter-supported monitoring activities are scheduled again this morning if the weather permits. Wind patterns continue to carry any ash ejected by the volcano toward the southern sector—toward the east and southeast at lower altitudes, and toward the south, southwest, and west at successively higher altitudes.

Seismic activity continues at low levels. Activity continues to taper off since about 09:00 on Sunday, May 25 (the end of the earthquake swarm that began with renewed eruption that day). There have been no earthquakes with magnitudes larger than 3 since last Thursday.

Report at 09:00, Wednesday, May 28, 1980

Mount St. Helens continued to erupt mildly throughout the day yesterday. During most of the day, the eruptive column appeared to consist of a mixture of condensed steam and varying amounts of ash. The amounts of entrained ash generally decreased through the day; by last night the eruptive column appeared to consist mainly of condensed steam although some ash continued to fall lightly on the side of the volcano from the plume blown off the column by the wind. The smell of H_2S was reported from the air downwind of the eruptive column.

The ash that was erupted from the volcano on Sunday (and in lesser amounts more or less continuously since) consisted of pumice and glassy ash particles, crystal fragments, and some rock fragments. Observers yesterday saw pyroclastic flows that had been emplaced on top of the week-old pumiceous pyroclastic flows on the north side of the volcano during Sunday's ash eruption. Pumice from these most recent eruptions consists of two types, one a light-colored very frothy pumice, and the other a darker somewhat denser type.

Tiltmeters on the south side of Mount St. Helens have shown substantially no deformation of the volcano or its vicinity since a slight deflation after the May 18-19 eruption. Attempts to establish new surveying points on the volcano have thus far been stymied by poor weather and locally hazardous working conditions on the volcano.

Seismicity continues at similar levels to the last several days. Local seismographs record a continuous low level of tremor; intermittent increases and decreases in the level of that tremor are frequent but do not indicate immediate changes in the eruptive state of the volcano. Through midnight last night, there had been no earthquakes of magnitudes 3 or larger since last Thursday.

Report at 09:00, Thursday, May 29, 1980

Activity at Mount St. Helens has declined over the past few days. After the ash eruption of last Sunday, May 25, the eruptive column rising from the volcano's crater consisted of a gray mixture of ash and condensed steam, the amount of ash varying from time to time. There has been progressively less ash each day since then, and by yesterday there was no ash visible in the column; it is essentially an atmospheric cloud, driven by thermal convection above steam vents in the crater.

Poor viewing conditions have prevented clear views of conditions within the crater. Radar imagery made by the Oregon National Guard suggests that a small edifice is being built on the crater floor, and occasional glimpses into the crater by aerial observers indicate that this may be a cone or rampart of pumice and ash. Last night a few bright spots were visible to observers viewing through light-enhancing night binoculars, but the significance of these spots is presently uncertain.

Seismicity at Mount St. Helens, having declined since an earthquake swarm early in the eruption last Sunday, remains low. The most pronounced seismic activity in the area during the past few days has been to the north, near Mt. Margaret, an area that has long been seismically active. A pair of earthquakes occurred at depths of about 4 miles in that area yesterday at 07:15 and 07:19. They had magnitudes of 4.0 and 3.8, respectively, and were felt as far away as the Portland area. There is presently no indication that the earthquakes near Mt. Margaret are associated with the volcanic activity at Mount St. Helens.

Report at 09:00, Friday, May 30, 1980

Observers in the plane that maintains round-the-clock aerial surveillance of Mount St. Helens last night made the first clear sightings of incandescent lava in the volcano's crater. These sightings, made both with light-enhancing binoculars and by the unaided eye, were made several

times after the crater partially cleared of clouds at about 01:14 this morning. These observations appear to confirm that the bright spots first seen the previous night recorded the presence of lava at the surface for the first time during the present period of eruptive activity. The spots seen during darkness are estimated by observers to have been as large as 20-30 feet in diameter and display a bright red glow that resembles molten iron.

The array of tiltmeters south of Mount St. Helens recorded no anomalous ground tilting of the area surrounding the volcano, and the level of seismicity remains lower than at any previous time since the seismic and eruptive activity began in late March.

Report at 09:00, Saturday, May 31, 1980

The effects of continued volcanic activity at Mount St. Helens remain confined to the crater except for a slight amount of fume that is carried by winds to the south. Steam rises continuously from the crater, and occasional ash eruptions occur at various vents on the crater floor. A rampart of ash and pumice has built up on the north side of the central crater, partly separating it from the amphitheater-like opening that was left by avalanching and explosive disruption of the north flank on May 18. Blocks of pumice or solidified lava are ejected from the crater vents at times along with the ash.

Only slight ground deformation is recorded by tiltmeters south of the volcano. Attempts continue to place surveying targets at points on the mountain in order to allow the monitoring of ground deformation on the volcanic edifice itself.

Seismic activity remains low. Virtually the only earthquakes have been to the north, in the Mount Margaret area. There have been a few periods of weak tremor; they begin gradually, build to only moderate intensity, and then die out within a few hours or less.

JUNE 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS

U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 09:00, Sunday, June 1, 1980

There has been substantially no change in the volcanic or seismic activity at Mount St. Helens during the past three days, since several small areas of incandescence were first observed in the crater. No topographic feature has yet emerged on the crater floor, so it appears that lava has not yet actually erupted to the surface as flows or a volcanic dome. The incandescence probably reflects the presence of magma very near the surface, releasing hot gases which heat the surface rocks in crater-like vents to temperatures high enough to produce the glow.

Profuse steaming continues from the crater vents, maintaining an eruption cloud that generally rises to altitudes of 10,000 to 15,000 feet above sea level. Other gases are also present in this eruption cloud, including the H_2S and SO_2 whose odors are recognizable to aerial observers. Instrumental measurements of SO_2 indicate that its level in the eruption cloud is slowly decreasing from those it had just after the eruptions that ended a week ago, but these $S0_2$ levels are still nearly 10 times greater than they were before the eruption of May 18.

Seismic activity remains low, and most of the earthquakes now being registered by local seismographs occur in the area 6 to 10 miles north, near Mount Margaret, and probably are related more to crustal stresses typical of the region than to the activity at Mount St. Helens.

Report at 09:00, Monday, June 2, 1980

There was no significant change in the eruptive activity of Mount St. Helens over the weekend. The crater continues to produce a column of steam that generally rises to about 10,000 to 12,000 feet above sea level. Poor weather is again hampering aerial observations from elevations above the volcano, but helicopter-supported operations continue on the ground in the vicinity of the volcano.

Earthquakes continue to be few and small beneath Mount St. Helens although there is continuing harmonic tremor, a type of continuous ground vibration. After having remained at a rather constant level for several days before, the level of harmonic tremor decreased by about 2/3 in the early hours after midnight on Sunday morning. Yesterday afternoon the tremor returned to its previous level. Such changes in the intensity of harmonic tremor have at some times been associated with changes in the eruptive state of the volcano, but--as yesterday's sequence of events shows--that is not always the case. The exact source of this tremor is not yet certain and may be different at different times.

Report at 09:00, Tuesday, June 3, 1980

There has been no significant change in the eruptive state of Mount St. Helens for several days. The volcano continues to emit a column of condensed steam from vents within its crater. The column generally rises to altitudes of 10,000 to 15,000 feet above sea level, and varying amounts of ash are ejected with the steam from time to time.

Earthquake activity is quite low. There were no earthquakes recorded in the immediate vicinity of the volcano on Sunday, and only three small ones on Monday. The level of harmonic tremor, however, increased somewhat during the early morning hours today.

Report at 09:00, Thursday, June 5, 1980

No report in this daily update series was issued yesterday.

The activity at Mount St. Helens remains about the same as it has since Wednesday, May 28. A column of condensing steam and other gases rises from the floor of the central crater to altitudes of 10,000-15,000 feet above sea level, but little ash is erupted and virtually none is ejected beyond the crater. In areas beyond the immediate flanks of the volcano, the various deposits of eruptions that have occurred since the morning of May 18 are still cooling. There are occasional small ashy eruptions from phreatic vents north of the volcano, near Spirit Lake, probably driven by steam from the heating of subsurface water from the lake and other subsurface drainages.

Recent instrumental measurements show that the volcano now emits a fairly constant level of 150-250 metric tons per day of SO_2, about 10-30 times more than it did before the eruption of May 18.

Ground tilting of the area south of the volcano also has continued at a nearly constant rate of about 1 microradian per day to the southwest; that rate has not changed substantially since several days before the eruption of May 18. This extremely small amount of deformation (a microradian is an extremely small angle of tilt, about 60 millionths of a degree) is not clearly indicative of any particular internal condition of the volcano and is quite unlike the bulging of the north flank that led to the May 18 eruption.

There has been almost no earthquake activity beneath Mount St. Helens for many days. The level of harmonic tremor varies from time to time with no visible changes in the eruptive state of the volcano.

Report at 09:00, Friday, June 6, 1980

The state of Mount St. Helens remains about the same as it has since late May. Seismic activity remains very low. No earthquakes have been recorded in the last 24 hours, and harmonic tremor has dropped to a very low level. The summit area has remained obscured by clouds for the past day and aerial observation have been hampered. Helicopter-supported operation continue on the ground near the volcano.

Measurements show that the rate of change of ground tilt continues at about a uniform rate.

Report at 09:00, Monday,June 9, 1980

Mount St. Helens continued in a relatively quiet state throughout the weekend. The usual steam and fume cloud continued to rise above the mountain to heights between 10,000 and 15,000 feet above sea level. Minor emissions of ash were observed above the summit crater, but fallout was confined to the crater itself and the upper slopes of the mountain.

No earthquakes were recorded as originating in the vicinity of Mount St. Helens, and no harmonic tremor was recorded. Ground tilt continues at about the same rate as during the last several weeks. Sporadic episodes of clear weather have permitted the re-establishment of several lines for ground deformation studies. These lines will be remeasured regularly as part of the program of monitoring the state of the volcano.

There were no reports for June 7 and 8 due to no significant changes.

Report at 09:00, Tuesday, June 10, 1980

Mount St. Helens remains relatively quiet. The persistent eruption plume emitted from the vent continues to heights of 10,000 to 15,000 feet above sea level. Periodically, a small amount of ash is included in the lower, more active parts of the plume. No harmonic tremor has been recorded, and seismicity is low. Several minor seismic events were recorded, however, that have been tentatively interpreted as rock avalanches within the summit crater. Underneath the persistent cloud cover, temporary improved visibility into the crater confirms the fact that new avalanches have occurred, but thus far none have been observed in progress.

The improved visibility allowed the discovery of a new lake within the crater. It occupies a portion of the northern sector of the crater floor; it is roughly crescent-shaped with a length of about 1,000 feet and a width of about 300 feet. Steam and gas are emitted from areas south of the new lake. The lake has evidently formed only within the last five days, as it was not present during the previous period of good visibility. Other than the new lake, the general configuration within the crater and the rates of gas and ash emission have not changed substantially throughout the last 10-12 days.

Report at 09:00, Wednesday, June 11, 1980

No significant changes have occurred at Mount St. Helens during the past 24 hours. The top of the eruption plume remains between 10,000 and 15,000 feet above sea level. Small amounts of ash are periodically emitted from the vents within the summit crater. Rock avalanches continue along the crater walls. No significant earthquakes or harmonic tremor have been recorded.

Report at 09:00, Thursday, June 12, 1980

Activity at Mount St. Helens during the past 24 hours continued the recent pattern of relative quiet. Poor visibility owing to clouds severely restricted aerial observations by U. S. Geological Survey and U. S. Forest Service personnel, but steam was occasionally seen rising to a maximum altitude of 13,000 feet above sea level. Only one minor ash eruption was reported, producing no significant ashfall. Seismic activity also remained at a low level. No harmonic tremor or earthquakes larger than magnitude 3 were recorded during the past 24 hours.

Field work scheduled today by U.S.G.S. personnel includes continued monitoring of deformation stations on the volcano's south and west flanks, and establishment of additional gravity stations for monitoring vertical ground movements.

Report at 22:30 hours June 12, 1980

Another eruption of Mt. St. Helens is currently in progress. Low level harmonic tremor which had been observed throughout the afternoon increased in amplitude at 7:05 p.m., and an eruption plume to 13,000 above sea level was first reported at 7:10 p.m. Activity varied in intensity until 9:11 p.m. when a distinct seismic event was followed by a large increase in harmonic tremor. U.S. Forest Service observers in a fixed-wing aircraft at the site reported a rapid rise of the eruption column to in excess of 35,000 feet. Ash emission and harmonic tremor continue at this time. Drift of the ash plume is to the South and Southwest, and ashfall was confirmed as far downwind as Vancouver, Washington at 10:50 p.m.

Report at 09:00, Friday, June 13, 1980

An eruption of steam and ash from Mount St. Helens which began shortly after 7:00 p.m. last night produced light ashfall in an area centered southwest of the volcano. The level of activity has subsided considerably this morning, but minor ash emission and low level harmonic tremor continue.

Weak harmonic tremor began at Mount St. Helens early yesterday afternoon, and continued until a marked increase in amplitude occurred at 7:05 p.m. An eruption plume to 13,000 feet above sea level was first reported at 7:10 p.m**.,** and radar observers tracked the eruption column to 37,000 feet shortly thereafter. Activity varied in intensity until 9:11 p.m., when a dramatic increase in harmonic tremor was accompanied by rapid rise of the eruption column to 50,000 feet. Heavy ash emission and strong harmonic tremor continued until shortly after midnight, when activity began to subside. Poor visibility has hampered observations of the volcano this morning, but minor ash emission and weak harmonic tremor continue.

No reports have been received of mudflows or floods in valleys near the volcano.

Report at 09:00, Saturday, June 14, 1980

Mount St. Helens has returned to a state of relative quiet after the eruption of June 12. Seismic activity and ground tilting continue at low levels, and a steam plume with little or no ash generally rises to 15,000 feet or less above sea level.

Initial ground observations yesterday confirmed that the most recent eruption produced several pumice and ash flows which issued from the crater and traveled northward toward Spirit Lake. One lobe of new material stopped roughly 20 meters short of the margin at the lake. The new pumice and ash flows ranged from 2-10 meters in thickness, and temperatures as high as 600°C (roughly 1100°F) have been measured. Additional aerial and ground observations are planned for today.

Report at 09:00, Sunday, June 15, 1980

Activity at Mount St. Helens yesterday was limited to a steam plume containing only a small amount of ash, which generally rose to less than 15,000 feet above sea level. Earthquake activity also remained at a low level. Several avalanches from the crater walls were recorded by seismometers and heard by ground observers in the area.

Progress was made in installing several new tiltmeters near the volcano, but an attempt to establish new gravity monitoring sites was again thwarted by poor weather. Planned activities today include another attempt to establish a network of gravity stations, servicing of seismometers near the volcano, and additional observations of the pumice and ash flows produced during the June 12 eruption.

Report at 09:00, Monday, June 16, 1980

The appearance of a small lava dome within the summit crater of Mount St. Helens was confirmed yesterday by observers in a fixed wing reconnaissance plane and by a helicopter crew engaged in monitoring activities. The new dome is roughly 200 meters in diameter and 40 meters high, with a distinctive bread-crust surface pattern caused by cracking of the crust as it cooled. It is located in the center of the large crater produced by the May 18 eruption, and is surrounded by a shallow moat. Water vapor and other gases are rising from the margin of the dome, and surface cracks occasionally expose the red interior permitting a faint glow to be visible at night from the reconnaissance plane. The dome represents the cooled, largely degassed top of a column of magma rising from beneath the volcano.

No anomalous seismic activity was associated with the appearance of the dome. A steam plume containing small to modest amounts of ash generally rose to less than 15,000 feet above sea level throughout the day.

The assessment of hazards from the volcano at this time is not changed significantly by the appearance of the dome. The dome may represent a late, less-highly explosive stage in a sequence that began with the eruption of May 18. However, the flank of the volcano directly north of the breach in the crater is especially subject to danger from small explosive events directed toward that flank by the shape of the crater and by the dome. In addition, the geologic

record at Mount St. Helens shows that some long-term eruptive episodes have included many highly explosive eruptive sequences. Thus, the volcano is still regarded as having the potential for highly explosive eruptions, both of large columns of pumice and gas that reach up into the stratosphere, and of pyroclastic flows that move down the volcano flanks and into adjacent valleys.

Report at 09:00, Tuesday, June 17, 1980

Observation and monitoring activity on Mount St. Helens was severely hampered by poor weather throughout the day on June 16. Partial clearing this morning, however, gives hope that geodetic lines can be remeasured and that new gravity stations can be established.

No significant earthquakes were recorded from the vicinity of Mount St. Helens, and no harmonic tremors were detected. Activity is confined to the persistent plume of steam and gas that rises to heights of 10,000 to 15,000 feet above sea level, and to frequent avalanches down the walls of the crater.

Poor visibility prevented observations of the newly-appeared lava dome within the crater. As conditions permit, the changes in its height, size, and configuration will be closely studied.

Report at 09:00, Wednesday, June 18, 1980

Mount St. Helens has definitely returned to a quiet phase following its most recent eruption on June 12. Partially clear weather allowed remeasurement of most of the deformation network, and no appreciable changes were revealed. The tiltmeters, which as recently as last week showed continued swelling of the volcano, are now indicating a reduced rate of swelling. No significant local earthquakes were recorded, and no harmonic tremor was detected.

The steam and gas plume continues to rise from the crater, but because of the lack of wind the fume fills the crater so the new dome remained hidden from view throughout the day. Occasional minor gas explosions throw dust and rock fragments to heights just above the crater rim.

Report at 09:00, Thursday, June 19, 1980

Mount St. Helens continued in a quiet mode. The new dome has grown approximately 60 feet in height since Sunday, a growth rate of about 20 feet per day. Questions regarding the total height of the dome cannot be easily answered because of the irregular surface of the crater floor and because the floor itself is unstable.

No significant earthquakes occurred in the area of the volcano, and no harmonic tremor was recorded.

Report at 09:00, Friday, June 20, 1980

Mount St. Helens remains generally quiet. The lava dome continues to rise at a rate of approximately 20 feet per day, and occasional rock avalanches descend the crater walls.

A small earthquake, magnitude 2.6, occurred at 11:05 a.m. It was centered near Elk Lake about 10 miles north of Mount St. Helens. No harmonic tremor was recorded during the past 24 hours.

Report at 09:00, Monday, June 23, 1980

Mount St. Helens spent a quiet weekend, and no earthquakes or harmonic tremor were recorded. The persistent fume and steam cloud continues to rise above the crater to heights as great as 14,000 feet above sea level.

Although glimpses were obtained of the dome within the crater, visibility was too poor to permit measurements of its growth.

The daily update report was not issued June 21 or 22, 1980.

Report at 09:00, Tuesday, June 24, 1980

Another quiet day has passed at Mount St. Helens. Seismographs recorded no earthquakes or harmonic tremor in the vicinity of the volcano, and heavy overcast shrouded the mountain preventing observations and monitoring activities from being carried out. Tiltmeters recorded no significant changes.

Report at 09:00, Wednesday, June 25, 1980

Mount St. Helens remained generally quiet for the past day, although two episodes of very weak harmonic tremor occurred during the night. The first episode lasted from about 8:50 to 9:20 p.m., and the second from 12:05 to 1:10 a.m. They were recorded only by the seismic station nearest the volcano. No earthquakes in the vicinity were recorded.

Poor conditions of visibility prevented any observations of the lava dome within the crater. The plume of steam and ash rose to a height of about 10,000 feet above sea level.

Report at 09:00, Thursday, June 26, 1980

Two small earthquakes occurred on Wednesday at 10:56 and 10:59 am, of magnitudes 2.5 and 2.0 respectively. Their epicenters were in the vicinity of Marble Mountain, about 6 miles

southeast of Mount St. Helens.

Persistent low clouds and heavy fuming prevented observation from being made of the lava dome within the crater.

Several episodes of weak harmonic tremor have occurred at Mount St. Helens during the last 24 hours, continuing the sporadic episodes that began two days ago. Tremor lasted from noon to about 8 pm, and resumed about 3:30 am and is continuing at a very low level Thursday morning.

Tiltmeters near the volcano began to show changes indicating ground shifting, and interpretation of the changes is in progress.

Report at 09:00, Friday, June 27, 1980

The weak harmonic tremor at Mount St. Helens on Thursday morning ended at about 9 a.m., and no subsequent tremor has occurred. No earthquakes in the vicinity have been recorded during the past 24 hours. Persistent poor visibility has continued to prevent observations of the dome within the crater.

Report at 09:00, Saturday, June 28, 1980

Several episodes of harmonic tremor occurred at Mount St. Helens on Friday. Even though the tremor was somewhat stronger than other episodes of recent days, it was much weaker than the tremor that has preceded any of the eruptions. At present it is simply signaling slight underground movements of magma, and the incoming records are being closely monitored.

Clouds and heavy fume continued to prevent observations of the lava dome within the crater.

There was no report for June 29

Report at 09:00, Monday, June 30, 1980

An earthquake of magnitude between 3.0 and 3.5 was recorded from the vicinity of Mount St. Helens at 10:42 pm on Sunday, June 29. The precise location and magnitude will be determined today after additional records can be examined and analyzed. A few very small episodes of harmonic tremor were detected during the weekend, but at a lower level than those reported for previous days.

Improved observing conditions over the weekend permitted the first measurements of the lava dome within the crater in more than a week. These measurements indicated that the dome has not grown in height since June 19. During this interim, reports from other sources based on

partial visual observations had indicated that the dome continued to grow, but contrary to such reports, the measurements this weekend show that the lava dome has become stationary. The dome will continue to be watched as closely as conditions permit to monitor future changes.

As of Monday morning, the plume of steam and fume is very slight, barely rising above the crater rim.

JULY 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS
U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 09:00, Tuesday, July 1, 1980

Mount St. Helens is quiet today. No earthquakes or harmonic tremor have occurred in the area within the past 24 hours, and the only action on seismographs have been caused by rock avalanches from the crater walls.

The plume of steam and other gases has varied in its visibility according to moisture conditions in the atmosphere, but measurements indicate that gas emissions continue at about a constant rate regardless of plume visibility.

Report at 09:00, Wednesday, July 2, 1980

Mount St. Helens remained quiet, although six small earthquakes occurred Tuesday evening between 9:34 and 11:30 p.m. These earthquakes were detected only by seismometers near the volcano and all measured less than Richter magnitude 2. No harmonic tremor has been detected.

The lava dome within the crater remains stationary. A small lake on the crater floor southwest of the dome changes in size, but it was clearly visible on Tuesday.

Report at 09:00, Thursday, July 3, 1980

Mount St. Helens has remained very quiet for the past 24 hours. No earthquakes or harmonic tremor were recorded, and geodetic and tilt measurements suggest a current condition of relatively stability. No changes have been detected in the condition of the lava dome within the crater.

Report at 09:00, Friday, July 4, 1980

Mount St. Helens remained relatively quiet during July 3, 1980. Clouds and rain obscured the mountain, but brief views from the U. S. Forest Service observer aircraft indicated the vapor plume from the crater attained altitudes of 9000 to 9500 feet. Three small shallow earthquakes occurred at 11:13, 15:11, and 18:56 local time. Tilt meters showed no significant changes during

the day. Field deformation measurements were not possible because of the poor weather.

Report at 09:00, Saturday, July 5, 1980

Mount St. Helens remained quiet during the 4th of July, 1980. The weather continued poor and visibility was obscured during most of the day. Occasional glimpses from the U. S. Forest Service observer aircraft showed the vapor plume reaching altitudes of 9,000 to 11,000 feet, and some new snow on the mountain above 6,000 feet. Two small shallow earthquakes occurred at 15:56 and 21:17 local time. The tilt meters showed no significant changes. Field deformation measurements were not possible because of the poor visibility.

Report at 09:00, Monday, July 7, 1980

Mount St. Helens remained relatively quiet during July 5 and 6, 1980. The weather improved during this period and visibility was excellent on July 6. Aircraft and ground observations showed the vapor plume reaching altitudes of 9,000 to 12,500 feet. Four earthquakes occurred in a brief swarm at a depth of 5 miles beneath Marble mountain, about 9 miles southeast of Mount St. Helens as follows:

Local Time July 6th	Magnitude
18:34	2.9
18:36	2.9
18:37	2.0
18:45	3.2

Some small shallow earthquakes continue to be recorded on the East Dome seismograph. The tilt meters showed no significant changes. Field studies indicated no deformation at present on or around Mount St. Helens, and no apparent growth of the lava dome. Measurements of sulfur gas in the plume indicated high rates of emission, in the order of 1800 to 2600 tons of sulfur dioxide (SO_2) per day. This gas is dispersed at high levels in the atmosphere and does not appear to pose any short-term environmental hazard.

There was no report for Sunday July 6, 1980.

Report at 10:00, Tuesday, July 8, 1980

Mount St. Helens continued to keep a low profile during July 7, 1980. The weather was clear and visibility excellent. The low humidity reduced the visible vapor plume to several hundred feet above the crater floor.

A few small earthquakes occurred near the mountain, but the general level of seismicity remains low. There was no tilt or volcanic tremor.

Report at 10:00, Wednesday, July 9, 1980

Mount St. Helens maintained its quiet state throughout Tuesday. The steam and gases emitting from the crater remained at about the same level as the day before and the vapor plume ranged between 8,000 and 12,000 feet. There was little or no seismicity throughout the night and no tilt or deformation.

Report at 10:00, Thursday, July 10, 1980

It's been another fairly quiet day at Mount St. Helens. The weather turned poor again and field operations were curtailed. The vapor plume from the crater was intermittently visible to an altitude of 11,000; it was emitted in more separate puffs rather than its usual continuous cloud. Some small shallow earthquakes continue to be recorded at the East Dome seismograph but the general level of earthquakes remains low. There was no change in tilt and no field deformation measurements were made because of the poor weather. The sulfur dioxide ($S0_2$) emission continues in the range of about 2000 tons per day.

Report at 10:00, Friday, July 11, 1980

Mount St. Helens remained quiet for another day. The weather improved and both air and ground visibility were fair to good. The vapor plume from the crater was rising slowly to altitudes of 9,000 to 10,000 feet. Several small shallow earthquakes were recorded at the East Dome seismograph, but most were too small to be recorded on any other seismic stations. There has been no sustained volcanic tremor since June 28. There was no change in tilt, and field measurements show no significant deformation of the mountain or growth of the dome.

Report at 10:00, Saturday, July 12, 1980

Relative quiet continues at Mount St. Helens. The weather was marginal and ground and air observations were intermittent. When visible the vapor plume was rising to altitudes around 9,500 feet. The small lake in the crater area has dried up and some apparently new cracks were seen in the crater floor between the lava dome and the east crater wall. Small shallow earthquakes continue to be recorded on the East Dome seismograph, but there was no volcanic tremor. The general level of seismic activity remains low, and there were no changes in tilt.

SEISMIC ACTIVITY AT MOUNT HOOD
Report for 24 hour period of July 11, 1980

Five small earthquakes were recorded on the Hood East seismograph by the USGS in

Menlo Park. They did not record on the other seismograph stations in the region so their locations are not known. The University of Washington/USGS group installed 3 portable seismic stations on Mt. Hood during the day to help locate further earthquakes in this current sequence. The recorded daily number of local earthquakes on the Hood East seismograph since last Sunday are as follows:

July 6-7	55
July 7-8	8
July 8-9	6
July 9-10	1
July 10-11	8
July 11-12	5

Gas analysis made from an airplane around Mt. Hood on July 11, showed no detectable amounts of sulfur dioxide (SO_2) or carbon dioxide (CO_2) above their normal atmospheric levels.

Report at 10:00, Monday, July 14, 1980

The current situation at Mount St. Helens remains stable. The weather was fair to good over the weekend. The vapor plume from the crater rose to heights of 9,000 to 12,500 feet, sometimes in individual puffs rather than a continuous column. The earthquake activity remained low except for the small shallow events recorded on the East Dome seismograph. There was no volcanic tremor and no significant changes in tilt. Field measurements showed no deformation of the mountain or growth of the lava dome.

This report covers a 48 hour period from July 12 thru July 13, 1980.

SEISMIC ACTIVITY AT MOUNT HOOD
Report for 48 hour period of July 12-13, 1980

The earthquake sequence at Mount Hood continued to wane in number. There were no detectable events on the records at Menlo Park from midnight to midnight July 12, and only one event of about magnitude 1 at 15:45 on July 13.

Report at 10:00, Tuesday, July 15, 1980

Mount St. Helens remained quiet again yesterday with no observed tilt, deformation, or volcanic tremor. Sulfur dioxide (SO_2) in the vapor plume was measured at 2000 tons per day.

SEISMIC ACTIVITY AT MOUNT HOOD
Report for 24 hour period of July 14, 1980

No significant earthquakes were reported from the Mount Hood seismic network.

Report at 10:00, Wednesday, July 16, 1980

Mount St. Helens continued to be relatively quiet, with no reported tilt, major deformation, or volcanic tremor. The visibility was excellent and the vapor plume, rising to altitudes of 9,000 to 10,000 feet, could be seen from Vancouver: Three earthquakes in the Elk Lake area were recorded as follows:

July 15 Pacific Daylight Time	Magnitude
8:11	1.7
9:56	1.1
20:41	1.6

SEISMIC ACTIVITY AT MOUNT HOOD
Report for 24 hour period of July 15, 1980
No significant earthquakes were reported from the Mount Hood seismic network.

Report at 10:00, Thursday, July 17, 1980

Mount St. Helens continued its repose. The weather also remained fair and the vapor plume was seen rising to altitudes of 9,000 to 10,000 feet. In the dawn flight of the Forest Service observer aircraft, dull orange-red glow was observed deep in the east-west crack on the lava dome. However, there is no apparent growth of the dome. No significant earthquakes, volcanic tremor, or tilt were recorded, but many rockslides (?) continue to be recorded by the East Dome seismograph.

SEISMIC ACTIVITY AT MOUNT HOOD
Report for 24 hour period of July 16, 1980
No significant earthquakes were reported from the Mount Hood seismic network.

Report at 10:00, Friday, July 18, 1980

It was another quiet day for Mount St. Helens. Good summer weather continued and visibility was excellent. The steam in the vapor plume was evaporating in the low humidity and at times the fume was nearly invisible, allowing excellent views of the lava dome. Gas measurements made on July 16 indicate a minimum of 1,000 tons per day of sulfur dioxide (SO_2) emission. There was no volcanic tremor, tilt, or significant earthquakes, and no measurable growth of the lava dome.

SEISMIC ACTIVITY AT MOUNT HOOD
Report for 24 hour period of July 17, 1980

There was one small earthquake recorded on 4 stations of the Mount Hood seismic net at 02:03 a.m., July 17. Four baseline geodetic measurements were established for monitoring any future deformation of the volcano.

Report at 9:00, Monday, July 21, 1980

Mount St. Helens showed some small vital signs over the weekend. The weather and visibility continued excellent, and the vapor plume was intermittently visible depending on humidity and windspeed. Higher humidity and lower windspeed tend to increase the height of the visible vapor cloud.

Six earthquakes were located at depths of 7 to 10 km in an area 3 km SE of Marble Mountain {14 km SE of the crater of Mount St. Helens}. Their times and magnitude were as follows:

	Origin Time	Magnitude
July 19	21:23 PDT	1.4
	21:47	1.4
July 20	06:30	2.1
	07:22	2.9
	10:36	1.9
	10:42	2.3

There was also some very low-level volcanic tremor on July 20 from 16:30 to 17:20 recorded on only the St. Helens West seismograph. No geodetic deformation was recorded, but there was slight deflation on the tiltmeter south of Mount St. Helens.

This report covers July 18, 19, and 20.

SEISMIC ACTIVITY AT MOUNT HOOD
Report for 48 hour period of July 19 and July 20, 1980

There were no significant earthquakes recorded on the Mount Hood seismograph net on July 19 and 20.

Report at 9:00, Wednesday, July 23, 1980

Mount St. Helens erupted at 17:14 on July 22 after a small swarm of shallow local earthquakes that began about 10:00 that morning. From 14:00 to 15:00 there were 4 earthquakes recorded by the University of Washington seismic net followed by 9 earthquakes from 15:00 to 16:00, and 20 earthquakes from 16:00 to 17:00. The first ash eruption which began at 17:14 lasted about 6 minutes and the cloud height reached 45,000 feet as measured by the U.S. National Weather Service radar at Portland.

The second ash cloud erupted at 18:25 and lasted about 22 minutes reaching a radar height

of 60,000 feet. The third and longest ash eruption began at 19:01 and lasted about 2 hours and 40 minutes. There were several maximum cloud heights during this last eruption (the highest was 45,000 feet on radar at 19:07 PDT) making it appear that there were more than three separate eruptions. Winds blew the main ash cloud to the northeast and satellite photos showed it crossing the Canadian border just north of Idaho. Pyroclastic flows were erupted on the north flank of Mount St. Helens, especially during the early period of the third ash cloud.

There was no volcanic tremor prior to the 17:14 eruption, but there was tremor associated with the periods of ash emission. Even though no preliminary tremor was recorded, the occurrence of the small earthquake swarm was reported to both the geologists and foresters working close to the mountain, alerting them to the potential hazard. No casualties or injuries have-been reported. Field deformation measurements made during the morning of July 22 showed a shortening of 5 centimeters per day in the survey line between the crater ridge just north of the lava dome and a point on the ridge just west of Spirit Lake (Harry's Ridge) during the period of July 18th to July 22nd. However, tilt meters and geodetic lines on the south, east, and west flanks showed no change. Gas emission during the morning of July 22 was measured at 1900 tons per day of sulfur dioxide (SO_2).

The eruption of July 22 was roughly similar in scale and nature to the ash eruptions of May 25 and June 12.

This report covers the period July 21 and 22.

Report at 9:00, Thursday, July 24, 1980

Mount St. Helens rapidly returned to its more quiet manner after yesterday's ash eruptions. Red glowing areas were noted in the crater during night flights of the Forest Service observer aircraft on July 22-23, and daylight observations on the 23rd revealed that much of the lava dome was destroyed and a new inner crater formed in its place. The vapor plume resumed its more normal low altitudes and sulfur dioxide emission was measured at 800 tons per day.

A few earthquakes at deeper levels beneath the volcano were recorded after the ash eruptions. No volcanic tremor has been recorded after the eruptions, and no tilt changes were recorded related to the activity of July 22.

MOUNT HOOD SEISMIC ACTIVITY

There have been no significant earthquakes recorded by the Mount Hood seismic net during the past few days.

Report at 9:00, Friday, July 25, 1980

Mount St. Helens has remained quiet since the spectacular ash eruptions during the evening of July 22. Good weather has continued, and field studies on the newly ejected ash and pyroclastic flows are well underway. Temperature measurements in the pyroclastic flows give readings up to 705^{o}C at depths of 5 feet, whereas surface temperatures on the flows are in the range of 70^{o} to 80^{o}C. The visible vapor plume was not prominent yesterday, but sulfur dioxide

emission was measured at a rate of 2,000 tons per day, a return to the high values observed in mid-July. Seismic activity was low, and there was no recorded tilt. The field deformation network, especially near the crater, was partially destroyed by the July 22 eruption, but most of the reflector stations have been replaced.

MOUNT HOOD SEISMIC ACTIVITY

Mount Hood remains quiet. No significant earthquakes were recorded by the seismic net.

Report at 9:00, Monday, July 28, 1980

Mount St. Helens ended a quiet weekend with a small ash eruption at 6:08 this morning. The ash emission came from the inner crater and rose very slowly to about 12,000 feet in altitude. Seismic tremor lasted about 20 minutes and started at approximately the same time as the small ash eruption seen by the TV monitor. At 02:00 a.m. July 28, the crew of the Forest Service observer aircraft reported glowing in the inner crater. No unusual seismic or deformation events preceded this minor ash eruption. Gas emission was measured on July 25 at 1,800 tons per day of sulfur dioxide.

This report covers July 25 to July 28 at 9:00 a.m.

MOUNT HOOD SEISMIC ACTIVITY

There have been no significant earthquakes recorded by the Mount Hood seismic net during the past few days.

Report at 7:00, Tuesday, July 29, 1980

Mount St. Helens remained relatively quiet following the small ash eruption at 6:08 to 6:25 a.m. reported yesterday. The vapor plume was intermittently visible to altitudes of about 10,000 feet, and small dust clouds from avalanches on the major crater walls were common. A continuing dull red glow in the inner crater was reported during the night of July 28-29 by crews of the Forest Service observation aircraft. One earthquake of magnitude less than 2 occurred in the Marble Mountain area at 13:30 on July 28. No tremor, tilt, or deformation was observed. Gas emission dropped to 700 tons per day of sulfur dioxide.

Report at 8:00, Wednesday, July 30, 1980

Mount St. Helens continued her restless repose yesterday. Intermittent puffs of white clouds formed from condensation of the vapor plume and rose to altitudes as high as 11,000 feet. Earthquake activity was low, and no tilt or deformation was recorded. Sulfur dioxide emission was measured at 1,100 tons per day.

AUGUST 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS

U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 8:00, Friday, August 1, 1980

Mount St. Helens continued in a quiet mode. Intermittent clouds of fume rose to 10,000 to 11,000 feet in altitude, sometimes mixed with dust from avalanches from the east crater wall. The night flights of the Forest Service observer aircraft continue to report red glows from the inner crater. The earthquake activity was low except for vibrations associated with the avalanches. No significant tilt or deformation was recorded.

Report at 8:00, Tuesday, August 5, 1980

Mount St. Helens continued quiet over the weekend. The vapor plume was intermittently visible to 11,000 feet depending on wind velocity and humidity. The dull to "cherry" red glow has continued to be visible in the inner crater at night as seen from the Forest Service observer aircraft. Earthquake activity has remained at a low level except for avalanche vibrations picked up on the East Dome seismograph. The tilt meters showed no change, but there have been small contractions in the field deformation survey line between the north rim of the inner crater and the ridge east of Spirit Lake (Harry's Ridge). This movement is very small, about one centimeter per day since July 30, and apparently indicates a minor outward movement of the north sector of the inner crater. Sulfur dioxide emission on August 3rd was 1,100 tons per day, and on August 4th it was 900 tons per day.

This report covers the period August 2 through August 4.

Report at 8:00, Wednesday, August 6, 1980

There have been no observed changes in the activity of Mount St. Helens during the past 24 hours. Yesterday's report can be extended through August 5.

Report at 8:00, Thursday, August 7, 1980

Mount St. Helens continued quiet yesterday, without significant changes in visible activity. Seismicity remained low, and tiltmeters around the volcano showed no changes from the past several weeks. Remeasurement of a survey line from the north side of the crater, northward to a

ridge west of Spirit Lake, reversed its recent trend by becoming slightly longer again after several days of contraction.

The emission of gases from the volcano has shown a consistent trend since the last significant eruption, on July 22, of decreasing concentrations of $S0_2$ and an increase in the ratio of CO_2 to SO_2. Yesterday, however, while SO_2 emission remained low, at a rate of 800 metric tons per day, the CO_2/SO_2 ratio decreased for the first time since the July eruption. No specific significance can presently be attached to this observation.

Report at 8:00 a.m., Friday, August 8, 1980

Mount St. Helens erupted yesterday afternoon. After an initial burst just before 4:30 pm, the volcano continued to produce intermittent small to moderate ash eruptions until late in the evening. Several precursory events preceded the eruption, allowing time for the withdrawal of ground crews from the immediate vicinity of the volcano before the eruption began.

The first indication of a possibly impending eruption was a change in the ratio of two gases that are emitted continuously from the volcano. The ratio of CO_2 to SO_2, which had been rising gradually since CO_2 measurements began in early July, had previously declined only once—just before the eruption of July 22. The ratio again declined the day before yesterday, as noted in yesterday morning's update. Volcanic tremor began at about noon PDT yesterday, and an earthquake of Magnitude 2.3 occurred in the vicinity of Marble Mountain, about 5 miles southeast of St. Helens' crater, at 12:38 while volcanic tremor increased in intensity. Following that sequence of events, USGS ground crews were withdrawn from areas closest to the volcano and the Emergency Coordination Center at the U. S. Forest Service was notified of the situation, allowing the volcano area to be cleared by the Forest Service and other public agencies.

As tremor intensity continued to increase, a second earthquake occurred at 2:58 pm. The first ash eruption began at 4:23, producing an ash-laden column that rose to an elevation of 44,000 feet within a few minutes. A small pyroclastic flow swept the area north of the breached crater of Mount St. Helens and reached part way to Spirit Lake but left only a small deposit. Smaller eruptions continued through the late afternoon and evening, the last significant burst occurring at 10:32 pm. The strength of the volcanic tremor has continued to decline and now is at a very low intensity. No further eruptive bursts have been observed, but a local weather disturbance has reduced visibility and produced lightning in the mountains around Mount St. Helens.

Report at 8:00 a.m., Saturday, August 9, 1980

Activity at Mount St. Helens is now in a mode that it characteristically shows after major eruptions. The volcano generally steams quietly, but there are occasional bursts of ash, steam, and fume that rise to elevations of 10,000 to 20,000 feet above sea level. These bursts are accompanied by small seismic events unlike normal earthquakes associated with the volcano. Seismicity has declined steadily since the eruption of August 7; volcanic tremor has ceased but there are infrequent small, moderately deep earthquakes.

The pyroclastic flows emplaced during last Thursday's eruption were examined yesterday and found to consist mainly of pumice and to have temperatures of 647°C near the crater and 639°C near their distal margin. A dome has started to rise within the crater formed during the eruption of July 22. By yesterday the dome had filled that crater to about half its former depth of nearly 300 feet; this morning the dome was observed to have risen another 70 feet.

Tiltmeters around the volcano continue to show no change. The surveying network to measure deformation of the volcanic cone was partly rerun yesterday and will be completed today. The emission of SO_2 from the volcano remains low, at about 900 tons per day. CO_2 emission also remains low, but the quantitative results of yesterday's measurements are still being calculated.

Report at 8:00 a.m., Sunday, August 10, 1980

Mount St. Helens continues to settle into its normal post-eruptive mode after the eruption of Thursday, August 7. Seismicity is now very low. The past day has seen none of the infrequent bursting emissions of gases and ash that occurred for more than a day after the main eruption ceased.

As it did after the last previous eruption, the amount of gas released has increased considerably during this post-eruptive phase. The emission of SO_2 has risen from a low of about 800-900 tons per day before the August 7 eruption: yesterday a value of at least 2,000 tons per day was measured.

Report at 8:00 a.m., Monday, August 11, 1980

Mount St. Helens remained quiet yesterday. Seismicity is very low, and there has been no change in the tiltmeter readings from instruments around the mountain. The dome rising within the crater after the eruption of August 7 had risen to within about 100 feet of the inner crater rim by Saturday morning, but there had been no further visible change by yesterday morning. Further observations will be made today.

On Friday August 8, immediately after the eruption, gas emissions remained low as they had been just before the eruption. $S0_2$ fluxes were in the range of 800 to 900 tons per day, and the ratio of CO_2 to SO_2 remained low, at about 2.2 (compared to typical ratios of 10-15 several days before the eruption). By Saturday, gas emissions had increased considerably and were highly variable, SO_2 being in the range of 1,500 to several thousands tons per day and averaging more than 2,000 tons per day. Yesterday gas emission was again low; SO_2 was 600 tons per day. CO_2 fluxes have also been measured on each of these days, but calculation procedures for the CO_2 measurements are more difficult and have not yet been completed. Computer programs are being written to enable more rapid calculation of the CO_2 flux rates and of the CO_2/SO_2 ratio for monitoring purposes.

Report at 8:00 a.m., Tuesday, August 12, 1980

Mount St. Helens remains quiet today. Seismicity remains low. The new lava dome within the small inner crater continued to rise but only slightly since last Sunday.

The first remeasurement since last Thursday's eruption of the deformation-monitoring line from the crater to the ridge west of Spirit Lake shows the line to have shortened about 6 centimeters since Friday. No significant changes in ground tilt around the volcano were recorded, and the tilt pattern appears unchanged since early June.

Gas emissions for the past two days were measured as follows:

	Aug. 10	Aug 11
SO_2 (tons per day)	600	900
CO_2 (tons per day)	3100	5100
CO_2/SO_2 ratio	5.2	5.4

Report at 8:00 a.m., Wednesday, August 13, 1980

Mount St. Helens remains quiet this morning. There have been no significant earthquakes for the past few days and no significant tilt for several weeks.

The dome that was rising within the small inner crater of the volcano has stagnated and has not risen appreciably since Sunday or Monday. Deformation-monitoring lines that are measured between the inner crater and a ridge west of Spirit Lake have shortened by 9 cm since the first post-eruption measurements last Friday.

Gas emissions remain low. SO_2 flux yesterday was 650 tons per day, CO_2 was 2,100 tons per day, and the ratio of CO_2/SO_2 is 3.2.

Report at 8:00 a.m., Thursday, August 14, 1980

Mount St. Helens remains quiet. No significant change has been noted in the various volcanic monitors during the last day except for an increase in gas emissions, as follows:

SO_2	3,400	tons per day
CO_2	19,000	tons per day
CO_2/SO_2 ratio:	5.6	

Report at 8:00 a.m., Friday August 15, 1980

Activity at Mount St. Helens remains low. There has been no recent change in the lava dome within the inner crater. Only a few very small earthquakes have occurred in the vicinity of the volcano since the aftermath of the last week's eruption although there have been numerous

rockfalls within the crater amphitheater.

The tiltmeters on the south flank of the volcano show no significant ground tilts. The network of lines surveyed to monitor volcano deformation was reoccupied yesterday, and the results will be calculated today.

Gas emissions remain high but below the levels measured the previous day. Yesterday's flux or SO_2 was 1,600 tons per day, and the CO_2 flux was 8,700 tons per day. The ratio of CO_2/SO_2 was 5.4.

Report at 8:00 a.m., Saturday, August 16, 1980

A very small eruption occurred at Mount St. Helens yesterday, beginning at 2:37 pm and continuing for less than 15 minutes. The eruption produced an ash-rich cloud that rose about 3,000 feet above the volcano, then gradually became whiter and less ash-laden until it dissipated a few minutes later. Volcanic tremor was recorded on seismographs during this small eruption but no seismicity preceded it; the tremor decayed as the eruptive burst waned. The eruption was similar to a brief burst in the early morning of July 28.

The deformation measurements made during the last two days showed only slight inflationary changes, repeating the pattern that has prevailed during non-eruptive periods since the measurements were reinitiated in mid-June. Tiltmeters on the south flank of the volcano show no systematic pattern of ground tilt. The level of seismicity remains low.

Gas emissions, measured less than an hour before the small eruptive burst, had declined notably from the previous day. The SO_2 flux was at a level below 800 tons per day, the CO_2 emission was at a rate of 2,400 tons per day, and the CO_2/SO_2 ratio was 3.2 at the time of measurement. The small eruption that occurred about an hour after these measurements were made may have been no more than a brief but rapid episode of gas emission that carried ash from the inner crater of the volcano in its initial upward burst.

Report at 8:00 a.m., Sunday, August 17, 1980

Mount St. Helens is quiet today, and has shown no significant volcanic or seismic activity since a single burst of ash and gas on Friday. The surface of the lava dome in the inner crater this morning is lower by about 20 feet than it was on Thursday, perhaps indicating an adjustment to the Friday burst.

Gas emissions measured in the atmospheric plume above the volcano yesterday were low, but quantitative measurement of those emissions were made difficult by the low concentrations and by high winds. The SO_2 flux rate was about 1,000 metric tons per day, CO_2 was less than 3,000 tons per day, and the ratio CO_2/SO_2 was less than 3.0.

Report at 8:00 a.m., Monday, August 18, 1980

No eruptive activity has occurred at Mount St. Helens since a very brief degassing event last Friday. Seismicity remains low.

The surveyed lines between the inner crater and a ridge west of Spirit Lake, which were shortening at a rate of about 3 cm/day a week ago, showed no net change between last Wednesday and yesterday. Together with yesterday's observation that the intra-crater dome had foundered somewhat, this observation may indicate that Firday's brief burst temporarily relieved pressure in the magmatic system.

Gas measurements yesterday showed an increased emission of SO_2, at a rate of 1,500 tons per day, together with a continuingly low CO_2 flux of 4,200 tons per day; the ratio of CO_2/SO_2 was 2.8. This pattern is quite similar to that which existed just before the eruption of July 22.

Report at 8:00 a.m., Tuesday, August 19, 1980

The volcano remains quiet this morning and shows no significant changes. There have been no earthquakes or consistent changes in ground tilt during the past day. Although gas measurements were made yesterday, poor weather conditions made impossible the calculation of emissions rates.

Report at 8:00 a.m., Wednesday, August 20, 1980

Mount St. Helens remains quiet, both volcanically and seismically. The surveyed line from west of Spirit Lake to the inside of the crater shortened only slightly yesterday.

With emissions of CO_2 remaining low at 3,700 tons per day, and $S0_2$ being rather high at 1,300 tons per day, the ratio CO_2/SO_2 remains low at 2.8.

Report at 8:00 a.m., Thursday, August 21, 1980

There has been no eruptive or seismic activity at Mount St. Helens during the past day although at times there have been small amounts of ash in the fume cloud rising from the inner crater.

Gas measurements yesterday showed the $S0_2$ flux to be 1,900 tons per day and CO_2 to be 3,300 tons per day. These emission rates and the low CO_2/SO_2 ratio of 1.7 now closely resemble those during periods of 1-3 days before the last two previous eruptions.

Report at 8:00 a.m., Friday, August 22, 1980

There has been no significant change in the state of Mount St. Helens or its activity during the past day.

Emissions of CO_2 were at a slightly higher rate of 6,900 tons per day; SO_2 flux was at 2,600 tons per day. The ratio CO_2/SO_2 was 2.7.

Report at 8:00 a.m., Saturday, August 23, 1980

As it has for more than a week, Mount St. Helens remains quiet. There has been no eruptive activity, and gas emissions generally are quiet. Seismicity occurs mainly as very local shallow events on the mountain itself, most of them resulting from rockfalls within the crater.

The surveyed deformation network continues to show a pattern, characteristic for noneruptive periods, of slight inflation or swelling of the volcanic edifice. The monitored line from near Spirit Lake to within the crater continued to shorten--yesterday by about l 1/2 cm.

Gas emissions, particularly CO_2 were somewhat higher again yesterday than on the preceding day, SO_2 flux was at 2,000 metric tons per day, CO_2 at 11,000 tons per day, and the CO_2/SO_2 ratio at 5.5.

The drainage that was disrupted and blocked by a great landslide and debris flow during the May 18 eruption is gradually being reestablished across the hummocky surface of the debris flow in the North Toutle valley. During the past few days water from Maratta Creek on the north side of the valley, which had been impounded by a natural debris dam, was released suddenly onto the surface of the debris flow and filled a small depression on its surface. This water has now stabilized in a depression having a surface area of a few acres, dammed by hummocky irregularities on the rock and earth surface of the debris flow a few miles east of Camp Baker. With time, this integration of drainage will continue, and there will be possibilities for short-lived increased flows in the North Fork of the Toutle River

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Report at 8:00 a.m., Sunday, August 24, 1980

There is no change in the state of Mount St. Helens; the volcano remains quiet both volcanically and seismically. The pattern of gas emissions appears to be returning to one more nearly typical of noneruptive periods, with SO_2 being emitted at a rate of 1,800 tons per day yesterday, CO_2 at 5,500 tons per day, and the ratio CO_2/SO_2 at 3.1

Report at 8:00 a.m., Monday, August 25, 1980

There has been no significant eruptive activity at Mount St. Helens for over two weeks. Seismicity also remains at low levels, with only infrequent very small earthquakes in the vicinity of the volcano and very shallow events from rockfalls and avalanches in the crater.

The net deformation of the volcano as surveyed over the past 10 days has been a very slight inflation--a few centimeters of outward displacement at most points. Such deformation is typical of times between eruptive periods.

There has been no change in the water impounded on the North Toutle debris flow east of Camp Baker.

Report at 8:00 a.m., Tuesday, August 26, 1980

Mount St. Helens remains quiet today, with no eruptive activity and very little seismicity. As measured yesterday, the net change in the surveyed lines from near Spirit Lake to the inner crater of the volcano have shortened only slightly (about 5 cm) in the past two weeks.

Gas measurements in the atmospheric plume above the volcano during the past 2 days showed a decrease, as follows:

	SO_2 (tons/day)	CO_2 (tons/day)	CO_2/SO_2
8/24	1,250	6,800	5.4
8/25	520	2,100	4.0

Report at 8:00 a.m., Wednesday, August 27, 1980

There has been no eruptive activity at Mount St. Helens during the past day although the lava dome and the walls of the inner crater it lies within remain incandescent. The weather closed in late yesterday, reducing visibility and hampering field operations.

There were two very small earthquakes in the area south of the volcano shortly after midnight last night. The surveyed lines from near Spirit Lake to within the large crater of the volcano have lengthened slightly for the past two days, suggesting a relaxation of stresses within the volcano.

Gas emissions yesterday were moderate. SO_2 emission was at a rate of 1,400 and CO_2 at 3,900 tons/day. The ratio CO_2/SO_2 was 2.8.

Report at 8:00 a.m., Thursday, August 28, 1980

Mount St. Helens remains quiet, volcanically and seismically. No new deformation surveys or gas measurements were made yesterday because of poor weather conditions. The weather is clearing, however, and full-scale field operations will resume today.

A small lake with an estimated volume of about 235 acre feet, which had been impounded on the debris flow near the base of Elk Rock, overflowed and drained downvalley during the afternoon of August 27. Although much of the water was retained by the check dam under construction, some overflowed the dam and damaged or destroyed some temporary bridges and portions of some access roads along the North Toutle River as far downvalley as the community of Toutle.

Report at 8:00 a.m., Saturday, August 30, 1980

Again this morning there is little volcanic or seismic activity at Mount St. Helens, continuing a period of quiet behavior that now has lasted for more than 2 weeks. The dome within the small inner crater has the same height and configuration it did within 2 days after its emplacement following the eruption of August 7. Deep cracks in the surface of the dome and a small cave-like reentrant on its west side that was blasted out on August 15 reveal the incandescence of its interior; cracks in the walls and floor of the inner crater also still reveal a red glow when viewed in partial darkness.

Seismic activity is nearly stagnant. The deformation monitor measured from near Spirit Lake to within the large amphitheater-like crater shows virtually no net change since about August 21 and has shown no rapid changes since an apparent inflation ended about August 12. Tiltmeters on the south flank of the volcano record such low rates of ground deformation that the trends can only be recognized by averaging them over periods of several weeks.

Gas emissions generally are moderate to quiet. Yesterday's measured emission rate of SO_2 was 1,000 metric tons per day, and CO_2 emission was at 6,000 tons per day. The ratio CO_2/SO_2 was 6.5.

No report in this update series was issued on August 29.

Report at 8:00 a.m., Sunday, August 31, 1980

There has been no change in the activity of Mount St. Helens during the past day. An episode of seismic noise was recorded yesterday morning but appears to have been caused by environmental conditions at the seismometer and not by volcanic tremor. Poor weather conditions have hampered visibility for the past two days and have prevented both deformation and gas measurements.

SEPTEMBER 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS

U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 8:00 a.m., Monday, September 1, 1980

Mount St. Helens continues quiet, with no significant volcanic or seismic activity. Deformation remains slight. Despite marginal to poor weather conditions at the volcano, it has been possible to continue the most important routine observations and measurements.

Report at 8:00 a.m., Tuesday, September 2, 1980

No significant changes occurred in the state of Mount St. Helens during the past day. High-frequency noise recorded by seismographs during the late afternoon and early evening has been interpreted as caused by wind rather than from volcanic causes. Poor weather conditions continue to hamper visibility and have prevented reliable deformation measurements. No gas measurements were made yesterday.

Report at 8:00 a.m., Wednesday, September 3, 1980

Mount St. Helens remains very quiet. No earthquakes or tremor have been recorded, and no volcanic activity of any kind has been detected. Poor weather conditions throughout the day on Tuesday prevented any deformation measurements or monitoring of volcanic gases.

Report at 8:00 a.m., Thursday, September 4, 1980

Mount St. Helens remains quiet seismically; no earthquakes or harmonic tremor have been recorded during the past 24 hours.

The weather, however, was clear, and deformation measurements could be carried out. Most lines showed no significant change since the last measurements about a week ago. However, the survey line between the north rim of the inner crater and the ridge east of Spirit Lake has showed a contraction of about 2 cm per day since the last measurements. This, along with new ground cracks in the area, suggests that minor outward movements are occurring in the north sector of the inner crater.

Report at 8:00 a.m., Friday, September 5, 1980

Several small earthquakes were recorded in the Mount St. Helens area through the night, but they appear to be of tectonic rather than volcanic origin. They began with a 2.5 magnitude quake at 8:46 p.m., then a swarm of four more quakes in the next 9 minutes. The epicenter was about 8 miles north-northwest of Mount St. Helens and 2 miles west of St. Helens Lake, at 2 to 4 km depth. Another small quake of unknown magnitude and epicenter took place at 12:06.

The weather remained good and deformation measurements were carried out. Most lines showed no significant change since yesterday. Lines to the rampart showed both contraction and expansion of small amounts, indicating rampart deformation without a consistent overall pattern. This interpretation agrees with the field observations of ground cracks of different displacements in the amphitheater.

Report at 8:00 a.m., Sunday September 7, 1980

No significant seismicity has occurred at Mount St. Helens and vicinity during the past 48 hours. A number of large landslides and rockfalls from the crater walls took place throughout the day on Saturday; the west wall was particularly affected. Large clouds of dust were produced, severely reducing visibility near the crater.

Measurements to the rampart on the north side of the inner crater on Friday indicated that the shortening trend detected earlier in the week is continuing. Measurements from one day to the next may indicate minor random variations, but the overall trend of slow northward movement of the rampart seems to be continuing. Distance measurements could not be taken on Saturday, however, because of dust.

Flights to carry out gas emission studies were made on both Friday and Saturday with the following results.

September 5: CO_2 - 2,800 tons per day, SO_2 - 600 tons per day, CO_2/SO_2 - 4.7
September 6: CO_2 - 5,000 tons per day, SO_2 - 1,300 tons per day, CO_2/SO_2 - 3.8

Lack of measurements earlier in the week owing to poor weather and then to instrumental problems make it difficult to determine the significance of the apparent downward trend in the gas ratio.

No report in this series was issued on Saturday September 6.

Report at 8:00 a.m., Monday, September 8, 1980

No significant seismicity was recorded in the Mount St. Helens area through the night. Large avalanches in the crater, however, have taken place intermittently during the weekend and through the night. These avalanches may be due to the continued small amounts of deformation of the crater area. Such deformation was shown again on Sunday by shortening of survey lines,

from the ridge west of Spirit Lake to the rampart and inner amphitheatre, of about one or two centimeters per day. Shortening of survey lines in the crater area, which commonly precedes major eruptions, has now been recorded for nearly two weeks. Lines to other parts of the volcano have shown almost no deformation.

Gas measurements were not made on Sunday, but those made last Friday and Saturday, reported previously, showed relatively low volumes of CO_2 and SO_2, and moderate ratios of CO_2 to SO_2. Low volumes of these gases and low CO_2 to SO_2 ratios preceded the eruptions of July 22 and August 7.

Report at 8:00 a.m., Tuesday, September 9, 1980

No significant seismicity has occurred at Mount St. Helens and vicinity through the night, except for numerous large avalanches off the walls of the amphitheatre. The inner crater continues to fracture and deform, but lines to the rampart area were not surveyed yesterday.

Gas measurements from yesterday morning showed the following: CO_2 - 4,400 tons per day; SO_2 - 1,600 tons per day; and CO_2/SO_2 - 2.4. Thus, compared to the values of September 6, CO_2 volume is slightly lower, $S0_2$ volume is higher, and the ratio between them is much lower. Yesterday's measurements are similar to those recorded the morning of the day before the eruption of July 22. The volcano is also similar today to what it was on July 22 in that a dome occurs in the inner crater and more than a month has elapsed since the last major eruption.

Report at 8:00 a.m., Wednesday, September 10, 1980

No significant seismic activity was recorded during the past 24 hours, except for large intermittent avalanches in the crater. The tiltmeters continue to show no change. Gas measurements were not made yesterday.

Yesterday's deformation measurements showed that the rampart north of the inner crater is continuing to move slowly outward. Since August 26 this movement has averaged about 1.2 centimeters per day. Only a small sector on the north side of the volcano is involved in this movement; deformation measurements elsewhere show essentially no change.

An interesting phenomenon was observed yesterday. Several small jets of ash were emitted from a vent near the base of the dome in the inner crater. Each lasted about a half an hour and involved a total of only a few cubic meters of material. They are the consequence of rapid escape of minor amounts of gas, but are probably of no great significance in the major behavior pattern of the volcano.

Yesterday's report generated considerable media speculation on the possibility of an eruption. Indeed, some conditions continue to resemble those that preceded some of the previous events, but these same conditions sometimes occur without an eruption. Hence it is not possible to predict any specific eruption—only to monitor and follow the general condition of the volcano. Under present conditions, if an eruption were to occur it would not be a surprise, but also the conditions might change without an eruption resulting.

Report at 8:00 a.m., Thursday, September 11, 1980

Mount St. Helens has remained quiet during the past 24 hours. No harmonic tremor has been detected, nor have any significant earthquakes been recorded.

The outward movement of the rampart on the north side of the inner crater has continued at a rate of a little more than a centimeter per day.

Gas measurements were carried out yesterday, but computation problems have delayed getting a figure for the CO_2: SO_2 ratio. The information will appear in tomorrow's report.

Report at 8:00 a.m., Friday, September 12, 1980

Mount St. Helens has been mostly quiet during the last 24 hours, but one very small earthquake did occur in the vicinity of the volcano at 50 minutes past midnight this morning. The magnitude and exact location have not yet been determined.

No gas measurements or deformation measurements were made yesterday. The delayed determination of gas measurements for September 10 are: CO_2 - 1,100 tons per day; SO_2 - 300 tons per day; ratio of CO_2: SO_2 = 3.7. Although total emission rates of both gases appear to be low, the ratio has increased above its minimum of 2.4 on September 9.

Report at 8:00 a.m., Saturday,September 13, 1980

Many large avalanches down the crater walls near the summit of Mount St. Helens were recorded by seismographs on Friday afternoon and early evening. Scientists working nearby could hear the roar of the avalanches, but the mountain was shrouded in clouds and the avalanches could not be seen. The avalanches subsided later in the evening, and only a few were recorded through the rest of the night.

No earthquakes or harmonic tremor were recorded, and clouds and poor weather prevented any other measurements from being made.

Report at 8:00 a.m., Sunday, September 14, 1980

The past 24 hours have been very quiet at Mount St. Helens. No earthquakes or harmonic tremor were recorded, and only a few small avalanches were detected by seismographs. Heavy clouds covered the mountain throughout the day on Saturday, and no measurements or observations could be made.

Report at 8:00 a.m., Monday, September 15, 1980

Mount St. Helens continued to be very quiet. No significant earthquakes or harmonic tremor were recorded, and avalanches diminished in number and size. Improving weather on Sunday permitted a few monitoring lines to be measured. These showed that the rampart on the north side of the inner crater continues to move slowly outward, though apparently at a somewhat diminished rate.

Report at 8:00 a.m., Tuesday, September 16, 1980

Mount St. Helens remains quiet. No harmonic tremor or significant earthquakes were recorded during the past 24 hours. Ground deformation measurements show that the rampart north of the inner crater continues to move outward, but at a very low rate. A few small avalanches were recorded.

Report at 8:00 a.m., Wednesday, September 17, 1980

Mount St. Helens continues to be quiet. No earthquakes or harmonic tremor were detected, and only a few small avalanches were recorded. Monitoring activities indicate no significant changes in the state of the volcano.

Report at 8:00 a.m., Thursday, September 18, 1980

Similar to the last several days, Mount St. Helens continues to be quiet. No earthquakes or harmonic tremor were detected, and only a few small avalanches were recorded. Monitoring activities indicate no significant changes in the state of the volcano.

Report at 8:00 a.m., Friday, September 19, 1980

Mount St. Helens continues to be quiet with a lack of significant earthquakes or harmonic tremor. Occasional small avalanches continue to be recorded. Adverse weather hampered monitoring activities throughout the day yesterday.

Report at 8:00 a.m., Monday, September 22, 1980

A single statement can summarize the condition of Mount St. Helens for the entire

weekend; the quiet conditions that have prevailed throughout the past couple of weeks are continuing. No earthquakes or harmonic tremor have occurred, and occasional small avalanches are recorded. Weather conditions improved on Sunday, permitting a few observations that indicated that very slow outward movement of the area north of the crater is continuing.

Separate reports for September 20 and 21 are not being issued.

Report at 8:00 a.m., Tuesday, September 23, 1980

No changes have occurred in the quiet status of Mount St. Helens. No earthquakes or harmonic tremor have been detected, and sporadic small avalanches are the only action being recorded. No geodetic measurements were made yesterday.

Report at 8:00 a.m., Wednesday, September 24, 1980

Mount St. Helens remains quiet seismically, with no significant earthquakes or harmonic tremor recorded. Measurements show that the rampart north of the inner crater continues to move slowly northward. Views into the summit depression show that portions of the dome in the inner crater continue to glow. Several cracks, first noted a couple of weeks ago in a pattern radial to the inner crater, show slight widening. These cracks are probably related to the slow northward movement of the rampart.

Report at 8:00 a.m., Thursday, September 25, 1980

At Mount St. Helens a minor but vigorous emission of gases took place between 9:17 and about 10:20 a.m. (PDT) on Wednesday morning. The gray plume rose above the crater to a height of approximately 9,000 feet above sea level, just clearing the rim, and drifted southward. No appreciable amount of ash could be found associated with the gas emission. No earthquakes or harmonic tremor were associated with the event.

However, at about 2 p.m., harmonic tremor did begin. The tremor was of relatively low amplitude and was intermittent in character, with some individual episodes lasting as long as 15 minutes but others lasting for less than a minute. The individual episodes were separated by periods of 2 to 15 minutes. After about two hours, the tremor episodes declined in number and duration, and by about 6 p.m. they were practically over. No tremor is occurring on Thursday morning.

Deformation measurements, including those to the rampart north of the crater, showed only minor changes that cannot be regarded as significant.

Report at 8:00 a.m., Friday, September 26, 1980

Mount St. Helens has remained quiet during the past day. Beginning at 7:40 a.m. this morning an episode of very low-level harmonic tremor began, but had ended by 8:00 a.m. Minor steam emission began at 7:47 and lasted for 9 minutes. All was quiet at 8 a.m. No geodetic measurements were made yesterday.

Report at 8:00 a.m., Sunday, September 28, 1980

No significant changes have occurred at Mount St. Helens within the past 48 hours. The brief episode of harmonic tremor early Friday morning has not been followed by any further events. Very slow northward movement of the rampart north of the inner crater had resumed, according to ground-deformation measurements made on Friday.

No report in this series was issued on September 27.

Report at 8:00 a.m., Monday, September 29, 1980

Mount St. Helens has remained quiet during the past 24 hours. A magnitude 2.1 earthquake occurred at 2:46 pm Sunday at a depth of approximately 1.9 km beneath Mount St. Helens. However, no harmonic tremor or other seismic activity were recorded during the day. Gas emission and geodetic measurements were not completed yesterday due to poor weather conditions which obscured the mountain most of the day.

Report at 8:00 a.m., Tuesday, September 30, 1980

Mount St. Helens continues to be quiet. No harmonic tremor or significant earthquakes were recorded during the past 24 hours; a few small avalanches were recorded. Monitoring activities indicate no significant changes in the state of the volcano.

OCTOBER 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS

U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 8:00 a.m., Wednesday, October 1, 1980

Mount St. Helens remains quiet. No earthquakes or harmonic tremor have been recorded by the seismic net during the past 24 hours.

Measurements made yesterday show that the sector on the north flanks of the volcano continues to move slowly northward. The rate of movement fluctuates from one day to another, but for the past month the average rate of the most mobile part has been slightly less than a half inch per day.

Report at 8:00 a.m., Thursday, October 2, 1980

Quiet continues to prevail at Mount St. Helens. No earthquakes or harmonic tremor have been recorded. Small to moderate avalanches continue to occur. Incandescent cracks continue to be observed under favorable viewing conditions on the dome within the summit crater. The trend of slow northward movement of the sector on the north flank continues, although minor fluctuations in the daily rate are common.

Report at 8:00 a.m., Friday, October 3, 1980

The volcano has continued to be quiet during the last 24 hours. No significant earthquakes and no harmonic tremor have been recorded. Small avalanches continue to occur on the inner crater walls. Dust rising from avalanches and picked up from other volcano slopes by strong winds decreased visibility and restricted work on the volcano yesterday—no further measurements of deformation of the north flank were made.

Report at 8:00 a.m., Monday, October 6, 1980

The volcano remained quiet through Friday, Saturday, and Sunday. No harmonic tremor or significant earthquakes were recorded during that time. Sporadic avalanches were seen and recorded throughout the weekend. Deformation measurements made on Saturday recorded only a very slight and not significant change.

Report at 8:00 a.m., Tuesday, October 7, 1980

Mount St. Helens was again quiet through Monday, with no harmonic tremor or significant earthquakes recorded. Avalanches continued on the inner crater walls.

Report at 8:00 a.m., Wednesday, October 8, 1980

Minor emission of gases continued at the volcano, and late in the afternoon a few plumes rose to altitudes of about 10,000 feet and drifted northeast. No appreciable amount of ash was seen in the plume.

No significant earthquakes were recorded yesterday. Low level, barely detectable harmonic tremor began a few minutes after midnight, but continued for less than an hour.

Report at 8:00 a.m., Thursday, October 9, 1980

The volcano continued to emit minor gas plumes, some of which contained small but noticeable amounts of ash. Two small shallow earthquakes, of magnitude 1.6 and 1.8, occurred at 3:35 and 3:37, respectively, yesterday afternoon. No harmonic tremor, however, has been recorded during the last 24 hours.

Deformation measurements made yesterday showed no measurable change of the north flank of the volcano.

Report at 8:00 a.m., Friday, October 10, 1980

A small plume of gas containing some ash erupted at about 9:12 am; it was accompanied by a small, near-surface seismic event and followed by a few minutes of low level harmonic tremor. The plume reached a maximum height of about 16,000 feet. At least two additional small gas plumes rose within the next 35 minutes. The ash and gas drifted to the west at low altitudes and to the northeast above about 10,000 feet.

At 2:19 pm, low level tremor started and was followed by gas plumes containing small amounts of ash at about 2:22 and 2:26, which rose to a maximum altitude of about 14,000 feet. Low level, intermittent harmonic tremor continued until shortly after 3 am. Low altitude winds blew the ash and a considerable amount of ash and other dust from the volcano surface toward the west during the day.

No deformation measurements were made yesterday.

Report at 8:00 a.m., Saturday, October 11, 1980

Several minor gas emissions containing small amounts of fine ash occurred between 09:15 and 11:00 on Friday. During this interval, intermittent very low-level harmonic tremor was detected. The first gas plume rose to an altitude between about 15,000 and 20,000 feet and drifted toward the north-northeast. Additional gas plumes accompanied by minor seismic activity were emitted twice during the afternoon, and again drifted toward the north-northeast.

Report at 8:00 a.m., Tuesday, October 14, 1980

Minor gas emissions continued with decreasing frequency and intensity throughout the weekend and the Columbus Day holiday. Minor seismicity accompanied some of these events. Occasional episodes of very low-level harmonic tremor were recorded, but none have occurred during the past 24 hours. Yesterday two very small seismic events were recorded in the vicinity of Mount St. Helens, at 11:15 and 19:00 local time.

No reports in this series were issued on October 12 or 13.

Report at 8:00 a.m., Wednesday, October 15, 1980

Mount St. Helens has remained mostly quiet during the past 24 hours. No significant earthquakes have occurred, and no harmonic tremor has been recorded. Poor weather has continued to prevent visual observations and monitoring activities from being made. The seismic record, however, suggests that occasional avalanches and small gas emissions are still occurring at irregular intervals.

Report at 8:00 a.m., Thursday, October 16, 1980

Mount St. Helens has remained generally quiet during the past 24 hours, although the seismic record was punctuated by three very small volcanic earthquakes. No harmonic tremor has been detected. Sporadic avalanches continue to occur. The first observations of the area of the crater floor in more than a week revealed some new ground cracking, which has been an occasional phenomenon during recent weeks.

Report at 8:00 a.m., Friday, October 17, 1980

Mount St. Helens erupted briefly last night, beginning at 9:58 pm. The eruption cloud of pyroclastic material reached a height of about 44,000 feet and was blown southward by

prevailing winds. Parts of southwestern Washington and northwestern Oregon, including the Portland-Vancouver area, received a light dusting of volcanic ash.

The eruption was preceded by characteristic seismic activity. Small, shallow earthquakes, which had occurred sporadically during the previous week, increased throughout the day Thursday to a rate of several earthquakes per hour by mid-afternoon. These were small events, mostly less than magnitude 1, but their frequency continued to increase to a rate of an event every few minutes by early evening. At 7:02 pm a magnitude 3 earthquake occurred, centered at Mount St. Helens, at a depth of about 1 km. The Forest Service and Geological Survey agreed that an advisory report should be issued, and about 8 pm State and County public safety officials were notified of a possible impending eruption.

Observers in the Forest Service spotter plane saw strong incandescence in the area of the inner crater of the volcano at about 9:57 pm. The eruption at 9:58 was accompanied by strong, regular seismic signals that are probably related to explosive release of volcanic gas. The eruption lasted only between 5 and 10 minutes. Seismic activity following the eruption was absent, and by 8 am today no further activity had occurred. In several previous eruptions, the initial burst was followed by significant harmonic tremor, but tremor has been completely lacking after the single burst of activity last night.

This eruption of October 16 is the first such activity in more than two months and is the fifth major eruption of Mount St. Helens following the catastrophic event of May 18. The other eruptions occurred on May 25, June 12, July 22, and August 7.

Report at 8:00 a.m., Saturday, October 18, 1980

Two additional eruptive events occurred at Mount St. Helens on Friday, October 17, as part of the eruption sequence that began on Thursday evening. The starting times of the two events were at 9:28 a.m. and 9:12 p.m., and all three phases were similar to one another in general characteristics, though different in certain details.

About 9 a.m. on Friday the seismographs began to record low level seismic activity, which was followed by the onset of the new volcanic activity at 9:28. A vertically directed, ash-laden eruption cloud rose rapidly; at 9:32 it was recorded at 30,000 feet, and by 9:38 it reached approximately 47,000 feet, its maximum height. Around 9:35, a pyroclastic flow was observed descending the ramp on the north flank of the volcano; it traveled a total distance of 3 to 4 km, barely reaching the base of the steep part of the cone, and came to rest in approximately 5 minutes. This was the only ash flow to occur during this eruptive phase. Vigor of the ash emissions declined gradually beginning about 9:40, and declined abruptly at 9:54, although sporadic activity continued until about 10:15. Seismicity also ended about the same time and remained quiet until evening. The winds were blowing in various directions at different altitudes; initially the eruption plume traveled in directions from eastward to southwestward, but ultimately the main part of the plume drifted southeast and south-southeast. Areas in the path as far as north-central Oregon received light dustings of volcanic ash for several hours during late morning and early afternoon.

Small seismic signals reappeared about 8:45 p.m., and they gradually rose in intensity. At 9:08, observers in the Forest Service spotter plane reported strong incandescence in the inner crater. At 9:12 p.m., a vertically-directed ash cloud marked the beginning of the eruption; this

coincided with a sharp increase in tremor amplitude on the seismographs. At 9:16 an incandescent pyroclastic flow was observed descending the ramp to the north, but further details on the duration and distance traveled are not available. At 9:19 the ash cloud reached its maximum height of about 45,000 feet. Thereafter the eruptive intensity gradually declined, and shortly after 10 p.m. the activity became intermittent. Pulses of ash and steam continued to be emitted until about 11:50 p.m., and intermittent seismicity continued until about the same time. Ash again drifted in a southeasterly direction. The volcano and the seismicity remained quiet for the rest of the night, punctuated only by an occasional small, shallow volcanic earthquake. Thus far, no deep earthquakes (10 to 20 km) have been recorded beneath the mountain, which have occurred at the end of all the previous 1980 Mount St. Helens eruptions. The events of this eruption have been generally comparable in size and behavior to the eruptions of July 22 and August 7.

Report at 8:00 a.m., Sunday, October 19, 1980

Intermittent activity at Mount St. Helens continued on October 18. Two pyroclastic eruptions occurred during the afternoon, one beginning at 12:35 p.m. and the other at 2:28 p.m. A new lava dome subsequently appeared and grew perceptibly through the remaining daylight hours.

The l2-hour spacing of the three previous events of this eruptive sequence prompted speculation that the volcano might have established a schedule, but Saturday morning passed without an eruption. Intermittent seismicity continued, however, consisting of very low-level seismic signals lasting from a few seconds to a few minutes, occurring at intervals from a minute to a quarter of an hour. Their persistent occurrence lent credence to the view that the eruptive sequence had not yet run its course. A 3-minute long episode of this seismicity beginning at 12:32 abruptly increased at 12:35, and a new eruptive cloud emerged from the vent. This event seemed somewhat lower-in energy than the previous three, and at, 12:39 the eruption plume reached its maximum height of about 20,000 feet. A new burst began at l2:46, and its plume reached a height of 25,000 feet about 3 minutes later. Vigorous emissions of pyroclastic material continued only until about 12:50, but intermittent, weak emissions continued for another quarter of an hour. The volcano gradually returned to repose, although the sporadic, low-level seismicity continued.

At 2:28 p.m. the eruptive activity resumed as a new plume of pyroclastic material emerged; by 2:32 it rose to its maximum height of 20,000 feet. Activity again tapered off rather quickly, and the eruptive episode was essentially over by 3 p.m. During both events the plume drifted southeasterly, and light ash falls were reported as far as north-central Oregon.

New deposits of pyroclastic material now cover the entire depression of the summit amphitheater, and the site of the former "inner crater", which contained the stagnant lava dome of August-October, was now marked by a broad, shallow, saucer-shaped depression. As visibility improved, about 3:20 .p.m. a new dome could be seen within this depression. When first seen it was estimated to be about 20 feet high and 100 feet across; an hour later it was 30 feet high and 135 feet across. As the dome grew, occasional slabs would spall off and roll down the flanks, revealing the bright, incandescent interior. Throughout the night, the incandescence continued as reported by observers in the Forest Service spotter plane. At 8 a.m., the dome was perceptibly

larger than the night before, though estimates of the dimensions must await closer examination. Intermittent and declining low-level seismicity has continued through the night, possibly accompanied by minor ash emissions from vents at the base of the dome.

An earthquake occurred at 11:23 p.m., centered about 5 miles west of Packwood, Washington. The magnitude 3 quake was strong enough to be felt by nearby residents. The location, however, about 35 miles northeast of Mount St. Helens, is distant enough to imply little likelihood of any direct connection with the current activity of the volcano.

Report at 8:00 a.m., Monday, October 20, 1980

Mount St. Helens gradually quieted down throughout the day on Sunday after its series of eruptive episodes that began on Thursday, October 16. The final pyroclastic episode occurred on Saturday afternoon, and was followed by the emergence and growth of a new lava dome as reported yesterday.

On Sunday morning the new dome was estimated to measure about 880 feet in an east-west direction, 700 feet in a north-south direction, and 165 feet high. Its main growth appeared to have ended, and throughout the day systematic sightings indicated a gradual decrease in height but a slow increase in width. Episodic noisy emission of gas occurred from various places around the base of the dome throughout the day, and fragments continue to spall from the surface and roll down the steep and overhung flanks. The dome has a shape rather like a mushroom, with rounded nearly symmetrical outlines, and an irregular, rough, breadcrusted surface.

Occasional low-level seismic signals persisted through the day and night to the present time, but they continue to decline in duration and frequency of occurrence.

Report at 8:00 a.m., Tuesday, October 21, 1980

Mount St. Helens has not exhibited any significant activity for the past 24 hours. The summit and crater region of the volcano remained shrouded in clouds for the entire day, and no observations could be made on possible changes in the new lava dome. Minor, low-level, intermittent seismicity was recorded from the summit area throughout the day, but frequency of events continues to decline. Two very small earthquakes were recorded from the Mount St. Helens area this morning, but as isolated events they have no particular significance. If additional quakes were to occur, their significance might be re-evaluated.

Report at 8:00 a.m., Wednesday, October 22, 1980

Mount St. Helens has remained quiet for the past 24 hours. No eruptions have occurred, and no significant seismicity was recorded. Clouds local to the volcano prevented clear views into the crater, but brief observations suggested that no major changes have taken place in the size or shape of the lava dome.

In spite of the lack of relatively deep earthquakes (10 to 20 km) following the volcanic activity of October 16-18, which have signaled the end of previous Mount St. Helens eruptions this year, the continuing quiet state of the volcano suggests that this eruption has likely come to an end.

Report at 8:00 a.m., Thursday, October 23, 1980

Mount St. Helens has shown no signs of returning to activity, and no harmonic tremor or significant earthquakes have been recorded during the past 24 hours. Good views of the new lava dome yesterday reveal that the only apparent changes are that the upper surface has sagged somewhat into a shallow, dish-like shape, and the margins have correspondingly spread outward a small amount, but no new growth has occurred.

Report at 8:00 a.m., Friday, October 24, 1980

Mount St. Helens has remained very quiet for the past 24 hours, with no eruptive activity, earthquakes, or harmonic tremor. High winds yesterday hampered observations and monitoring activities, but partial views suggest that no noticeable changes have occurred on the lava dome.

Report at 8:00 a.m., Monday, October 27, 1980

Mount St. Helens remained quiet over the weekend, although the quiet was punctuated by a couple of episodes of seismicity. On Saturday morning, October 25, a series of small, shallow seismic events occurred between about 11 and 11:30 a.m. (PDT). These were accompanied by individual plumes of visible steam that rose to an elevation of about 12,000 feet, but nothing further occurred.

On Sunday October 26, a shallow volcanic earthquake of magnitude about 2 occurred at 5:20 p.m. (PST). It was followed by several additional smaller events over the next few hours, but by late evening seismicity had returned to essentially quiet conditions.

Visibility on the volcano was poor throughout the weekend, and no significant observations were made.

No reports were issued in this series on October 25 or 26.

Report at 8:00 a.m., Tuesday, October 28, 1980

Mount St. Helens has remained quiet for the past 24 hours, with no harmonic tremor and no significant earthquakes. Remeasurement of stations on the north flank shows that the slow northward movement of the rampart is continuing. No significant changes have been observed in

the lava dome.

Report at 8:00 a.m., Wednesday, October 29, 1980

Mount St. Helens has continued to be quiet for the past 24 hours, and no harmonic tremor or significant earthquakes have been recorded. Frequent rock avalanches down the steep crater walls are occurring, and these events are recorded on the nearest seismographs. No significant changes have taken place on the lava dome. Gas vents near the dome are fuming vigorously, and several cracks on the surrounding crater floor are continuing to widen very slowly.

Report at 8:00 a.m., Thursday, October 30, 1980

Quiet continues to prevail at Mount St. Helens, with no harmonic tremor or significant earthquakes recorded during the past 24 hours. Vigorous gas fuming continues in the vicinity of the lava dome, and frequent rock avalanches continue to descend the crater walls. The ground in the crater area continues to be unstable, as shown by cracking and by fluctuating measurements on established distance-monitoring lines.

Report at 8:00 a.m., Friday, October 31, 1980

Mount St. Helens remains quiet, with no harmonic tremor or earthquakes recorded during the past 24 hours. Avalanche activity, however, continues at a fairly high level. Distance-monitoring lines on the north flanks of the volcano continue to fluctuate slightly, indicating persistent instability in the vicinity of the dome and crater floor. The lava dome shows no significant changes. A winter storm is moving in, and the adverse weather will prevent visual observations and other monitoring activities.

NOVEMBER 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS
U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 8:00 a.m., Monday, November 3, 1980

Mount St. Helens remained mostly quiet over the weekend. No significant earthquakes or harmonic tremor have been detected since the report on Friday October 31. Poor weather hampered observations and studies over the weekend. No reports in this series were issued on November 1 and 2.

Report at 8:00 a.m., Tuesday, November 4, 1980

Mount St. Helens has remained quiet for the past 24 hours; no earthquakes and no harmonic tremor have been recorded. Landslides have been recorded, but bad weather has prevented any access or observations.

Report at 8:00 a.m., Wednesday, November 5, 1980

Mount St. Helens has remained quiet for the past 24 hours; no earthquakes and no harmonic tremor have been recorded. Landslides continue to be recorded. Some deformation measurements were made but have not yet been reduced.

Report at 8:00 a.m., Thursday, November 6, 1980

Seismic activity on Mount St. Helens remains at the same low levels that it has for the past 12 days. Rock avalanches in the crater also continue in about the same numbers. Distance-monitoring lines on the north flank of the volcano measured on the 4th and 5th of November show the continued slow northward movement of the rampart.

Report at 8:00 a.m., Friday, November 7, 1980

Mount St. Helens has remained quiet for the past 24 hours, and the seismographs show records of rock avalanches as well as high winds associated with a current storm. No significant

earthquakes or harmonic tremor have been detected.

Report at 8:00 a.m., Monday, November 10, 1980

Mount St. Helens remained quiet through the entire weekend; no significant earthquakes or harmonic tremor were recorded. During stormy periods, high-amplitude background noise caused by strong winds was recorded. Also the teleseism from the early morning earthquake of November 8 near Eureka, California was distinctly recorded. Bad weather prevented other observations or monitoring activities from being carried out on the volcano.

No reports in this series were issued on November 8 or 9.

Report at 8:00 a.m., Tuesday, November 11, 1980

Mount St. Helens remained very quiet for the past 24 hours, with no significant earthquakes or harmonic tremor being recorded. Clear weather permitted several lines to be remeasured, and they showed no significant changes. However, a dense cloud of condensed vapor prevented the lines to the north rampart from being remeasured.

The weekend storm caused considerable gullying in the deposits from the 1980 eruptions on all flanks of the mountain and in adjoining areas.

Report at 8:00 a.m., Wednesday, November 12, 1980

Mount St. Helens has continued in its quiet state with no significant earthquakes or harmonic tremor. Several large avalanches have occurred, leaving fresh scars on the east wall of the summit crater. Fresh snow mantles the outer slopes of the cone, and cold temperatures in the vicinity of the mountain remind workers of the forthcoming winter.

Report at 8:00 a.m., Thursday, November 13, 1980

Mount St. Helens remains quiet, with no earthquakes or harmonic tremor recorded. Remeasurement of established lines shows that no significant changes have occurred for the past couple of weeks. For the moment, all flanks of the volcano seem to be stable.

Report at 8:00 a.m., Friday, November 14, 1980

Mount St. Helens remained quiet yesterday, and no harmonic tremor or significant

earthquakes were recorded during the past 24 hours. Laser distance measurements show that the mountain has remained essentially undeformed through the period from October 21-22 to November 12-13.

Report at 8:00 a.m., Tuesday, November 18, 1980

The relative quiet at Mount St. Helens continues. There were a couple of brief episodes of low level tremor on Monday November 17, but poor weather prevented any visual observations. A few deformation measurements were made on Saturday, and they showed no changes.

No reports in this series were issued on November 15, 16, or 17.

Report at 8:00 a.m., Wednesday, November 19, 1980

Mount St. Helens remains quiet with only a couple of brief episodes of low level tremor in the last two days. Poor weather has prevented access to or visual observations of the summit area.

Report at 8:00 a.m., Thursday, November 20, 1980

Mount St. Helens remains quiet except for one brief episode of low-level tremor late yesterday morning. It was similar to the brief episodes of the previous three days. Although tremor has been recorded, it is of such low-level that it fades in and out of detection by the sensitive seismographs at Mount St. Helens. Tremor onset and duration times have not been documented because of its weak and sporadic character in the last three days. periods of intermittent, low-level tremor have been observed on previous occasions without an associated eruption.

Poor weather continues to hamper visual observations of the summit region.

Report at 8:00 a.m., Friday, November 21, 1980

Mount St. Helens remains quiet; the episodic, low-level tremor of the past few days apparently continues. The seismic noise created by the wind and rain makes it difficult, if not impossible, to clearly identify low-level tremor on the records.

Ground deformation measurements made yesterday show that the rampart north of the inner crater continues the slow northward movement that has prevailed over the past weeks. A light coating of ash was discovered on the snow near the crater yesterday. It is re-worked material that was probably deposited sometime during the past 2 days.

Report at 8:00 a.m., Monday, November 24, 1980

The sporadic low-level tremor at Mount St. Helens continued over the weekend. Deformation measurements made on Saturday, November 22 show the slow, continued northward movement of the rampart that has prevailed over the past several weeks.

A new fumarole at the base of the dome on the southeast side was noticed on November 22. The light coating of ash discovered on November 21 was probably deposited during the formation of this new fumarole. If so, the fumarole probably formed on November 19 or 20.

No reports in this series were issued on November 22 or 23.

Report at 8:00 a.m., Tuesday, November 25, 1980

The sporadic low-level tremor at Mount St. Helens continues. Higher-level tremor was recorded beginning at 8:54 p.m. PST, but it gradually decreased into noise level 35 or 36 minutes later. The Forest Service observer aircraft reported a slightly brighter glow in the dome area after the tremor event.

Poor weather conditions at Mount St. Helens prevail, hampering other volcano monitoring activities.

Report at 8:00 a.m., Wednesday, November 26, 1980

Intermittent low-level tremor continues at Mount St. Helens. Two new vents at the northeast edge of the dome were observed yesterday, November 25. They apparently formed sometime between the afternoon of November 24 and noon of November 25.

Report at 8:00 a.m., Thursday, November 27, 1980

Low-level, intermittent tremor at Mount St. Helens continues. A break in the weather permitted measurement of a few lines in the deformation network on the volcano. The few lines that were measured show continued northward movement of the rampart area.

Report at 8:00 a.m., Friday, November 28, 1980

The low-level tremor that has characterized seismicity at Mount St. Helens for the past 10 or 11 days was interrupted by higher-level tremor at 8:34 p.m., November 27. This higher-level tremor lasted for about one hour.

Because of weather and normal Thanksgiving Day activities, no other measurements were made yesterday, November 27.

DECEMBER 1980

VOLCANIC AND SEISMIC ACTIVITY AT MOUNT ST. HELENS

U.S. Geological Survey and University of Washington
Vancouver and Seattle, Washington

Report at 8:00 a.m., Monday, December 1, 1980

Low-level tremor continues at Mount St. Helens. Higher-level tremor was recorded on three or four occasions over the weekend but each time it faded into background level within a few minutes.

A few deformation measurements were made on November 28; they showed a continuation of the trend reported in previous update.

No reports in this series were issued on November 29 or 30.

Report at 8:00 a.m., Tuesday, December 2, 1980

Seismic activity remains at the same level as it has for the past week. Poor weather prevented any deformation measurements yesterday.

Report at 8:00 a.m., Wednesday, December 3, 1980

Seismic activity remains at the same level as it has for the past week. Poor weather prevented any deformation measurements or any visual observations of the summit.

Report at 8:00 a.m., Friday, December 5, 1980

Poor weather has prevented any measurements or visual observations on Mount St. Helens for the past five days. In addition, the two seismic stations near the summit were not operational during parts of the day, December 4, because of the severe weather. This impaired our ability to detect the low-level tremor that has prevailed over the past two weeks. One of the two critical stations is now operational, and the low level seismic-activity continues.

No report in this series was issued on December 4.

Report at 8:00 a.m., Monday, December 8, 1980

Seismic activity remained at about the same level as it has for the past few weeks. Two or three bursts of higher-level tremor of a few minutes duration occurred on Sunday, December 7. One of the bursts was accompanied by volcanic activity that sent a plume to about 10,000 feet.

Deformation measurements made December 6 and the morning of December 7 interestingly showed a halt and possibly even a reversal of the slow northward movement of the rampart area. Further measurements and analyses will be made to verify this change in trend.

No reports in this series were issued on December 6 or 7.

Report at 8:00 a.m., Tuesday, December 9, 1980

Seismic activity at Mount St. Helens remains at the level of the previous five or six days. The good weather of the past three days has permitted a flurry of much needed field measurements and instrument maintenance on Mount St. Helens. The results of this work will be assessed in the next few days.

Report at 8:00 a.m., Wednesday, December 10, 1980

The low-level tremor punctuated by occasional bursts of higher amplitude tremor continues. One of these bursts at 1:25 p.m. PST was accompanied by a plume that reached an altitude of about 9,000 feet. The seismic and visual characteristics of this activity were similar to those recorded and observed on Sunday, December 7.

Report at 8:00 a.m., Thursday, December 11, 1980

Seismic activity at Mount St. Helens continues at the same low level. One or two of the higher-amplitude tremor episodes during the night were similar to the episodes of the past week that were accompanied by increased plume activity. However, no plume sightings were reported last night.

Report at 8:00 a.m., Friday, December 12, 1980

A light deposit of fresh ash marks the higher part of the south slope this morning. The seismic record over the last 24 hours shows an episodic low-level tremor with a burst occurring at 04:17, returning to current background level about 30 minutes later. Low clouds with some precipitation made deformation measurements impossible yesterday.

Report at 8:00 a.m., Monday, December 15, 1980

Low-level tremor with occasional bursts of higher-level tremor continued over the weekend. A burst at 8:17 p.m. PST, Saturday, December 13, was accompanied by a plume that reached an altitude of 17,000 feet. No reports in this series were issued on December 13 or 14.

Report at 8:00 a.m., Tuesday, December 16, 1980

Low-level tremor with occasional bursts of higher-level tremor continues.

Observations made yesterday of the dome emplaced during the October eruption showed some interesting changes. A vent on the south edge of the dome has been replaced by a small crater, and fumes are no longer visible there.

In addition, a small part of the dome nearest the crater has been blown out and/or fallen into the crater. The part that has been removed is crudely triangular in shape with dimensions of about 50 feet along the outer edge and extending about 100 feet towards the center of the dome. Presumably the dome fractured, and the crater formed during the venting activity that produced the December 13 plume.

Report at 8:00 a.m., Wednesday, December 17, 1980

Seismic activity continues at the same level as the past two weeks. A plume reaching an altitude of about 11,000 feet was reported that was apparently associated with increased tremor at about 8:00 a.m. PST.

The vent at the south edge of the dome that was reported to have ceased fuming in yesterday's update has apparently been reactivated.

Report at 8:00 a.m., Thursday, December 18, 1980

Seismic activity continues at the same level as the past two weeks. A plume reaching the altitude of about 11,000 feet was reported that was apparently associated with increased tremor at 3:20 p.m. PST.

Thick fog at Vancouver prevented any helicopter operations yesterday.

Report at 8:00 a.m., Friday, December 19, 1980

Seismic activity continues at the level of the past few weeks. Deformation measurements in the summit area show little or no change in the past 10 days.

With continuing cool weather and lack of precipitation, streamflows are dropping off in the Toutle River Basin. The North Fork Toutle River at Kid Valley is flowing at about 1,000 cfs (cubic feet per second). The mean daily flow was about 6,000 cfs during the storm runoff of December 2 and 3.

The Cowlitz River at Castle Rock is flowing about 14,000 cfs. The mean daily flow on December 3 was about 28,000 cfs.

The water level of Spirit Lake has risen 2.3 feet between November 22 and December 16.

Report at 8:00 a.m., Monday, December 22, 1980

Saturday and Sunday were accompanied by the same level of seismic activity that Mount St. Helens has been experiencing for the past weeks.

One event Sunday at 2:09 p.m. PST was observed briefly through the clouds by ground observers and airline pilots. A plume apparently reached 20,000 feet. No radar or later visual observations confirmed sustained venting. Seismograph recordings confirmed a short burst which then returned to background levels.

Weather prevented any work on the mountain this weekend.

The rains over the weekend have caused the rivers to rise in the Toutle River Basin. The water level of the Cowlitz River at Castle Rock has risen from 9.7 feet at 11:00 a.m. on December 21 to l2.5 feet at 8:45 a.m. on December 22.* The water level is well below the 23.0 feet flood stage established by the National Weather Service.

No reports in this series were issued on December 20 and 21, 1980.

*Streamflow information is based on preliminary computations and is subject to revision.

Report at 8:00 a.m., Tuesday, December 23, 1980

Monday's seismic activity was low except for a few small seismic bursts at 3:40 p.m., 11:23 p.m., and at 6:52 a.m. PST. These events were much smaller than the event on Sunday.

No observations have been made on the mountain for 3 days.

HYDROLOGIC CONDITIONS

Streams draining the Mount St. Helens area are receding following the December 21-22 rains. The Toutle River near Silver Lake was flowing about 9,000 cfs* at 8 a.m. this morning. The Cowlitz River at Castle Rock was flowing about 20,000 cfs at that time. The flow at Castle Rock was measured at 27,800 cfs on December 22 at 11:30 a.m. The National Weather Service is predicting another wet weather system coming in tonight.

*Streamf1ow is based on preliminary computations and is subject to revision.

Report at 8:00 a.m., Wednesday, December 24, 1980

Seismic activity continues at the same level that has been evident for the past 3 weeks.

At 12:58 PST seismic activity was recorded on stations around Mount St. Helens. Field observers reported a simultaneous increase in plume emissions, containing minor amounts of tephra, and reaching a maximum altitude of approximately 9500'. The activity was not sustained, returning to background level within minutes. New cracks in the crater floor were apparent after this event. Poor visibility inhibited further observations.

Deformation measurements show northward displacement of the rampart station has occurred since readings were last taken December 18. Cracks that are monitored appear to be widening as well as extending radially from the inner crater.

As of 6:00 AM streams draining the Mount St. Helens area had not responded to the precipitation that started early this morning. The stage at Cowlitz River at Castle Rock was 12.2 feet below the NWS 23.0 feet flood stage. The National Weather Service is expecting light rain throughout the day with a stronger storm front carrying heavier rains to reach the area later tonight.

Poor weather has grounded field parties today. Barring a significant change in volcanic activity. The next daily update will be December 26.

Report at 8:00 a.m., Friday, December 26, 1980

No field work was accomplished yesterday, December 25. Some recognizable trends suggest a slight increase in seismic activity, although much of the record was obscured because of the stormy weather.

Field parties will attempt to work this morning. Another storm front is expected to reach the mountain area early this afternoon.

Report at 8:00 a.m., Sunday, December 28, 1980

An increase in the number of seismic events recorded on instruments around Mount St. Helens was first observed by University of Washington and U.S. Geological Survey personnel on Christmas morning. These events, including numerous shallow volcanic earthquakes, continued at an increased rate and prompted the issuance of an advisory at 1520 PST, December 27. This advisory notified concerned agencies of the change in volcanic activity.

Bad weather prohibited scientists from reaching the mountain on Friday the 26th and Saturday the 27th. At 0900 PST, Sunday December 28, U.S. Forest Service and U.S. Geological Survey observers were able to view the crater from a light plane. A new extrusion, occurring in the southeast corner of the present dome and estimated to be one-forth the size of the dome was reported. A spine-like structure protruding between 100' and 200' from the central area of the dome was first seen at approximately 10:00 a.m.

Scientists will continue aerial observations and monitoring activities throughout the day.

Seismic activity is continuing at this time.

Report at 8:00 a.m., Monday, December 29, 1980

Scientists were able to reach Mount St. Helens yesterday, December 28, and confirm the presence of a new extrusion from the southeast corner of the dome. Closer observations concurred with earlier aerial size estimates; the new formation was approximately 1/4 the size of the present dome. A small spine (estimated to be approximately 30 meters high) formed, but toppled at approximately 1540 PST, leaving a base of about 8 meters standing. Deformation measurements show significant northward movement of the rampart and notable widening of monitored cracks within the crater floor.

Seismic activity has not returned to background level this morning. Although the frequency of events has decreased, shallow earthquakes are continuing. Monitoring activities will continue today.

Report at 8:00 a.m., Tuesday, December 30, 1980

Weather conditions allowed scientists only a brief glimpse into the crater yesterday morning, December 29. No quantitative data was obtained. "Steam" rising from the dome prohibited any but the most cursory observations. Scientists felt that the new extrusion may have increased somewhat in height overnight.

Seismic activity has declined steadily over the last 24 hours with only 2 minor earthquake events occurring over the last 12 hours.

The poor weather remains with us today, and it is not possible to fly.

HYDROLOGIC CONDITIONS:

Water Resources Division field crews worked over the Christmas holidays measuring streamflow and sediment loads. Measurements are currently being analyzed. The flows were the highest experienced thus far this winter in the Toutle River Basin. The Toutle River at Silver Lake and the North Fork Toutle River near E1k Rock gaging stations were destroyed by the high flows, and several other stations were left inoperative. The water level of Spirit Lake has risen 2.7 feet from December 19 to December 26.

Report at 8:00 a.m., Wednesday, December 31, 1980

No field observations were made yesterday. There has been very low level seismic activity continuing over the past 24 hours.

This morning observers in the Forest Service airplane were able to see clearly into the crater for the first time since December 28. The new dome has increased in height and size.

Preliminary estimates suggest it is approximately the same size as the October dome.

Scientists are on their way to the field at this time.

HYDROLOGIC CONDITIONS

Streams draining the Mount St. Helens area are still receding following the high flows of December 24-25. The Toutle River near the mouth at the Highway 99 bridge was measured at 6,430 cfs* on December 30. The flow of the Cowlitz River at Castle Rock was about 32,000 cfs at that time. Crews are working to put stream gaging stations, damaged as a result of the high flows, back into operation.

*Streamflow is based on preliminary computations and is subject to revision.
