



**FORMAL STATEMENTS FOR “CALL-DOWN”, 1980 – 1999**  
**U.S. Geological Survey and University of Washington**  
**Vancouver and Seattle, Washington**

Written Information Statements, Extended Outlook Advisories, Volcano Advisories, and Volcano Alerts issued from 1980 through 1999

Compiled by Bobbie Myers, 2005

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In 1980, a notification and warning network for rapid dissemination of volcano hazards information was developed at Mount St. Helens. Statements were jointly written by the U.S. Geological Survey Cascades Volcano Observatory (CVO) and University of Washington. These statements were released to the U.S. Forest Service for telephone call-down to government agencies and private interests. Initially the statements were verbal; however as precursory patterns became more recognizable, a series of written statements was issued weeks to hours before an eruption – providing advance warning of hazards. Once the call-down was underway, public and media information tapes were updated and press releases were issued.

Some events such as steam explosions (with or without ash), avalanches, rockfalls, and small mudflows can occur without recognizable precursors. When these events occurred, Information Statements or Advisories were issued during or immediately after the more notable ones.

For more information on notification and warning systems at Mount St. Helens (past and present) see the following web page.

<http://vulcan.wr.usgs.gov/Volcanoes/MSH/EruptionAlert/framework.html>

**1980-1999**

**MOUNT ST. HELENS**

**WRITTEN INFORMATION STATEMENTS, ADVISORIES, AND ALERTS**

U.S. Geological Survey and University of Washington

Vancouver and Seattle, Washington

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**VOLCANO ADVISORY**

**JANUARY 2, 1981**

**9:00 AM, PST**

The crater dome is continuing to grow, small to moderate earthquakes continue to be recorded within or immediately beneath the volcano, and the crater floor continues to show signs of updoming. The USGS and the University of Washington interpret this activity to indicate renewed movement of magma (since about 12/26/80) to immediately beneath the crater floor. Until the nature of this new magma can be determined, it is not possible to say whether further activity will be explosive, continued dome growth with or without mild explosions, or non-explosive. This is the first known influx of fresh magma since March and April, combined with the new (post 5/18) geometry of the mountain means we have a different mode of activity with an appropriate need for caution.

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**VOLCANO ADVISORY**

**JANUARY 9, 1981**

**7:30 AM, PST**

On the basis of recent measurements at Mount St. Helens, scientists of the U.S. Geological Survey and University of Washington feel the potential for a large explosive eruption has decreased. The activity appears to have returned to pre-December 25, 1980 levels.

We believe, the hazards inside the crater, however, continue at higher levels, because the dome remains unstable.

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**VOLCANO ADVISORY**

**FEBRUARY 4, 1981**

**12:00 PM, PST**

There has been an increase in the number of shallow volcanic earthquakes beneath Mount St. Helens over the last half day. It is too soon at this time to say whether this will lead to

an eruption or, if so, what the nature of that eruption might be. We will advise you if there are any additional changes.

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VOLCANO ALERT

FEBRUARY 5, 1981  
4:00 AM, PST

The seismic data of the last several hours indicate that an eruption of Mount St. Helens will probably begin within the next 12 hours. This seismic and geologic data indicate the eruption will most likely be of the dome building kind as was the one of December 27-January 4. However, due to some similarities of precursors before the explosive ash eruption of July 22 and October 16 and the current ones, we feel that an explosive eruption is a definite possibility.

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VOLCANO ADVISORY

FEBRUARY 5, 1981  
1255 hrs, PST

The crater dome is growing again, and the eruption is following a course very similar to that of the December 27-January 4 eruption.

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VOLCANO ADVISORY

FEBRUARY 7, 1981  
11:45 AM, PST

Seismic activity at Mount St. Helens has remained at a low level for the past 36 hours. Field observations and measurements indicate that the rate of growth of the dome has decreased significantly. If this eruption continues to follow the pattern of the December-January eruption, scientists of the USGS and the University of Washington feel that the potential; for a large explosive eruption in the immediate future has decreased. However, we caution as before that if (repeat if) an explosive eruption were about to occur, we might not see adequate precursors. Local hazards associated with the growing dome remain high. We will issue a further advisory when dome growth has stopped.

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VOLCANO ADVISORY

FEBRUARY 10, 1981  
9:50 AM, PST

The dome has stopped growing, and the latest eruption has apparently ended. Seismicity and other indicators are back to their normal levels. Occasional, small steam emissions may continue.

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VOLCANO ADVISORY

FEBRUARY 13, 1981  
11:45 PM, PST

The earthquake which occurred at 10:09 this evening had a Richter magnitude of 5.4-5.6 and was centered near Elk Lake, 10-12 miles northwest of Mount St. Helens, at a depth of 3 miles. A series of smaller aftershocks is continuing at this time. The earthquake does not appear to be volcanic.

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EXTENDED OUTLOOK ADVISORY

MARCH 30, 1981  
3:30 PM, PST

Rates of ground deformation in the crater of Mount St. Helens have increased during the past two weeks. In the past, similar deformation has preceded eruptions. Seismicity remains low, although it has increased slightly since mid-March. These increases in activity do not --- repeat, do not --- suggest that an eruption is imminent, but do suggest that if current trends continue, an eruption within the next week or two is likely. It is too soon to forecast the date or probable nature of such an eruption. This extended outlook advisory looks ahead for a longer period than previous advisories, and will be followed by more specific advisories.

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VOLCANO ADVISORY

APRIL 9, 1981  
11:00 PM, PST

There has been an increase in the number of shallow volcanic earthquakes beneath Mount St. Helens over the past 6 hours. If seismicity continues to increase, an eruption will probably occur within the next day or two. This updates the advisory of 3/30/81, which was based primarily on deformation measurements. We will advise you of additional changes.

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VOLCANO ALERT

APRIL 10, 1981  
6:30 AM, PST

Seismicity at Mount St. Helens has continued to increase, and an eruption will probably begin this morning. We do not know yet what type of eruption is most likely.

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VOLCANO ALERT UPDATE

APRIL 10, 1981  
9:00 AM, PST

There was a small eruption at approximately 8:21 AM with an ash-bearing plume which rose to 15,500' and drifted for a short distance to the N-NE. The USGS cautions that more eruptive activity may follow. Clouds obscure the crater area preventing observation of the dome.

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VOLCANO ALERT UPDATE

APRIL 11, 1981  
11:20 AM, PST

Seismicity at Mount St. Helens is continuing but at a lower level than seen yesterday. Present seismicity resembles but is not identical to that of earlier dome-building eruptions. Poor weather has prevented observations on and near the volcano. Further eruptive activity is possible.

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VOLCANO ADVISORY

APRIL 12, 1981  
10:00 PM, PST

Late this afternoon U.S. Geological Survey geologists confirmed that renewed dome growth has occurred. Seismic activity remains low. Until more detailed field measurements are made, we do not know whether the dome is still growing or what additional activity, if any, is likely during this eruption.

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VOLCANO ADVISORY

APRIL 14, 1981  
8:30 AM, PST

Recent dome growth has slowed significantly following the general pattern of the December-January and February eruptions. Seismicity remains low. Chances of explosive activity are now significantly lower than when the alert for this eruption was issued. We will advise you when activity returns to pre-eruption levels.

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VOLCANO ADVISORY

APRIL 15, 1981  
9:10 PM, PST

Dome growth has essentially stopped. Seismicity remains low though not quite back down to pre-eruption levels. This latest eruption appears to be over, although minor readjustments may still occur in and around the dome.

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EXTENDED OUTLOOK ADVISORY

JUNE 12, 1981  
1:00 PM, PDT

Rates of ground deformation in the crater of Mount St. Helens have increased during the past three weeks. Sulfur dioxide gas emissions have also increased over the same period. Similar changes have occurred in advance of previous dome-building eruptions. If current trends continue, an eruption, probably of the dome-building type, will begin within the next week or two. In the meantime, highly visible steam and ash bursts, similar to those of past weeks, are likely to continue. Seismicity remains low, and based on previous experience, seismicity can be expected to increase at least a day or two before a new eruption. This extended outlook advisory will be followed by more specific advisories, if and when seismicity shows a clear increase.

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VOLCANO ADVISORY

JUNE 18, 1981  
11:30 AM, PDT

Rates of ground deformation in the crater and rates of sulfur dioxide gas emissions have continued to increase since the last advisory (6/12/81). There has also been a distinct overnight increase in the number of shallow volcanic earthquakes beneath Mount St. Helens. Based on previous pre-eruption patterns, a dome-building eruption accompanied by increased steam and minor ash emission will probably begin within the next day or two. We will advise you of additional changes.

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VOLCANO ALERT

JUNE 18, 1981  
5:15 PM, PDT

Seismicity and crater tilt have increased significantly within the past several hours, and the expected eruption will probably begin within the next 12 hours. Poor weather conditions will make it difficult to know exactly when the eruption begins.

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VOLCANO ALERT-UPDATE

JUNE 19, 1981  
12:15 AM, PDT

Changes in ground tilt and seismicity, beginning about 5 PM, suggest that renewed dome growth may have begun. We will not be able to confirm new dome growth, however, until weather permits visual observations in the crater.

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VOLCANO ALERT-UPDATE

JUNE 19, 1981  
12:20 PM, PDT

U.S. Geological Survey scientists have just confirmed new dome growth in the crater, and are attempting to gather further information. Weather conditions continue to make observations difficult.

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VOLCANO ADVISORY

JUNE 21, 1981  
12:45 PM, PDT

Observations in the crater indicate that dome growth has essentially stopped. Seismicity remains low, though not quite back down to pre-eruption levels. The eruption appears to be over, although minor re-adjustments may still occur in and around the dome.

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EXTENDED OUTLOOK ADVISORY

AUGUST 26, 1981  
8:00 AM, PDT

Ground deformation rates in the crater of Mount St. Helens have increased during the past week. These changes resemble those that preceded the dome-building eruptions in December, February, April, and June. Rates of gas emission are also increasing. If this trend continues, an eruption probably of the dome-building type, will likely begin in one to three weeks. At this time seismicity remains low, but any future increase may permit a

more precise forecast, probably from half a day to about 2 days before a new eruptions. This advisory will updated as conditions warrant.

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VOLCANO ADVISORY

SEPTEMBER 6, 1981  
8:00 AM, PDT

Rates of ground deformation in the crater have continued to increase since the last advisory (August 26, 1981). In addition, within the past 6-8 hours there has been a distinct increase in the number of shallow volcanic earthquakes beneath Mount St. Helens. Based on previous pre-eruption patterns, a dome-building eruption accompanied by increased fume but little or no ash emission will probably begin within the next 12 to 48 hours. We will advise you of additional changes.

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VOLCANO ALERT

SEPTEMBER 6, 1981  
1:30 PM, PDT

Seismicity and crater tilt have increased significantly within the past four hours, and the expected eruption will probably begin within the next 12 hours.

*(Supplemental information to Alert --- U.S. Geological Survey and University of Washington scientists issued a volcano advisory at 0800 AM PDT today, forecasting an eruption within the next 48 hours. This was followed by an alert issued at 1:30 PM PDT stating that the eruption is expected to begin in the next 12 hours. USGS scientists in Vancouver have measured increased rates of ground deformation and observed major avalanching from the dome in the crater of Mount St. Helens. They have also measured increasing sulfur dioxide gas emissions. In addition, University of Washington seismologists report a distinct increase in the number of shallow volcanic earthquakes beneath Mount St. Helens.*

*Based on previous pre-eruption patterns, the scientists conclude that renewed dome growth will probably begin soon. This eruption is likely to be accompanied by increased fume but little or no ash emission, but there is only a small likelihood of significant explosive activity.)*

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ALERT UPDATE

SEPTEMBER 6, 1981  
7:00 PM, PDT



Since the 1:30 PM alert, there has been a leveling off or slight reduction in the frequency of shallow volcanic earthquakes beneath Mount St. Helens. There has also been a reduction in the number of rockfalls from the composite dome. However, USGS field crews report increased radiant heat and structural changes on the ENE side of the dome. A small amount of what may be newly extruded material has been observed near the site of maximum rockfall activity. These observations appear to indicate that a dome-building eruption is in progress.

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ALERT UPDATE

SEPTEMBER 7, 1981  
5:00 AM, PDT

Earthquake activity has gradually declined since the peak of activity at about 1:00 PM PDT, September 6. Seismic activity at 9:00 PM had subsided to low, but slightly above normal levels.

Rock avalanches from the east and northeast margins of the dome were observed beginning at 8:00 AM, September 6. The frequency of avalanching increased until between 2 and 3 PM and then gradually decreased. In mid-afternoon structural changes were observed at the eastern margin of the dome indicating that new dome growth was in progress. After nightfall, patches of incandescent rock were observed on the east side of the dome in the area of maximum avalanche activity.

As of 5:00 AM, September 7, the seismic activity remains low. Further observations of dome activity will be made at daybreak.

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VOLCANO ADVISORY

SEPTEMBER 7, 1981  
6:00 PM, PDT

Observations in the crater indicate that dome growth has essentially stopped. Seismicity is at pre-eruption levels. The eruption appears to be over, although minor re-adjustments are occurring in and around the dome.

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EXTENDED OUTLOOK ADVISORY

OCTOBER 24, 1981

Increases in the rates of movement of the ground near the lava dome in the crater of Mount St. Helens indicate that an eruption is likely within the next two weeks, possibly early in this period. If an eruption occurs, it will most probably consist of the quiet

addition of lava to the dome and is not expected to provide hazards beyond the immediate vicinity of the volcano.

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VOLCANO ADVISORY

OCTOBER 30, 1981  
9:15 AM, PST

Seismicity in the crater of Mount St. Helens has increased significantly in the past few hours. From past experience, the current seismic behavior suggests that a dome-building eruption is likely to begin within the next 24 hours.

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VOLCANO ADVISORY

OCTOBER 30, 1981  
11:00 AM, PST

Seismicity in the crater of Mount St. Helens has increased significantly in the past few hours, to a level that suggests a dome-building eruption is likely within the next 24 hours. Changes in the pattern of ground tilt beginning yesterday (October 29) resemble those that preceded the June and September eruptions. In the past, this type of eruption has been accompanied by increased steaming, but poses little possibility of explosive activity.

Stormy weather conditions have prevented other measurements and observations from being made during the past several days. As poor weather currently prevails, it is unlikely that the beginning of the eruption will be observed.

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ERUPTION ALERT

OCTOBER 30, 1981  
3:20 PM, PST

Seismicity in the crater of Mount St. Helens suggests that either an eruption has begun or will begin soon. The seismic pattern resembles that observed during previous dome-building eruptions, but stormy weather is preventing observations by which confirmation of the activity would be possible.

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ALERT UPDATE

OCTOBER 31, 1981  
8:00 AM, PST

Fixed wing observations of Mount St. Helens early this morning confirm eruptive activity in the form of renewed growth of the crater dome. Glowing areas and continuous incandescent rockfalls suggest that dome growth is still in progress.

Seismicity has decreased but continues at above background levels. USGS field crews are presently on their way to the mountain.

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ALERT UPDATE

OCTOBER 31, 1981  
12:30PM, PST

Field crews have confirmed this morning's observations of new dome growth. Marginal weather (steam and high winds) is making detailed observations of the new lobe difficult. Sporadic rockfall activity off the dome suggests that dome growth is continuing. Seismic activity continues to decrease and is comprised primarily of rockfall activity.

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VOLCANO ADVISORY

NOVEMBER 2, 1981  
4:45 PM, PST

Seismicity at Mount St. Helens has declined to a low level. Observations today in the crater suggest that the major phase of lava extrusion has finished, although sluggish movement of the new lobe of lava and associated rockfalls will probably continue, perhaps for a few more days. Volcanic hazards beyond the immediate vicinity of the dome and crater are very low.

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EXTENDED OUTLOOK ADVISORY

MARCH 5, 1982  
9:00 AM, PST

Seismicity at Mount St. Helens increased around February 21 and has remained at a level somewhat above background since that time. Approximately 100 earthquakes that occurred during this period have been located. These earthquakes fall into two groups: 1) a 'deep' group of very small earthquakes with centers at 6 to 11 km depth, and 2) a shallow group of somewhat larger (magnitude 1 or less) earthquakes located at 3-4 km up to the surface. There is a pronounced lack of seismicity at a depth of 4-6 km.

Although poor weather during the past week has hampered observations and monitoring on the mountain itself, measurements made last week show only slow ground

deformation in the immediate vicinity of the dome, and no significant increase in gas emissions.

Another update will be issued when more data is available from field measurements.

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EXTENDED OUTLOOK ADVISORY

MARCH 12, 1982  
8:00 AM, PST

Seismicity beneath Mount St. Helens continues at elevated levels, but individual earthquakes are of low magnitude. Earthquakes have been occurring in 1-2 day long episodes separated by 1-2 day intervals of decreased activity. The earthquakes are occurring between the surface and a depth of about 6 miles. Rates of ground deformation in the crater area have increased during the last two weeks, and they are similar to patterns observed before previous dome building eruptions.

Based on rates of deformation, an eruption is likely within the next 3 weeks. Deformation is confined to the crater area, suggesting that renewed dome growth will occur;. The current seismic patterns differ from any observed before 1980-81 eruptions, however, and raise the possibility of more hazardous variations in eruptive behavior. If there were to be any pyroclastic flows, from either an explosive eruption or collapse of the steep north face of the dome, the possibility of rapid snowmelt would be a concern.

*(Short form for USFS call-down ----- Seismicity and deformation at Mount St. Helens have increased in recent weeks. If current trends continue, an eruption is likely within the next 3 weeks. Another episode of dome growth is most likely, but because current seismic patterns are different from any previously observed at Mount St. Helens, other kinds of more hazardous activity are also possible.)*

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VOLCANO ADVISORY

MARCH 15, 1982  
7:00 PM, PST

Accelerating rates of ground deformation in the crater of Mount St. Helens suggest that an eruption, most likely of the dome-building type, will probably begin within 1 to 5 days. Deep earthquakes have almost ceased, and shallow earthquakes continue at a moderate rate. A further increase in shallow seismicity is likely before the eruption starts.

VOLCANO ALERT

MARCH 19, 1982  
9:00 AM, PST

Seismicity at Mount St. Helens has increased significantly during the past day. This indicates that an eruption will begin soon, probably within the next 24 hours. The character of both the seismicity and deformation in the crater area indicate that the most likely type of activity is dome growth.

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VOLCANO ALERT UPDATE

MARCH 19, 1982  
8:25 PM, PST

The eruption has subsided for the time being and an ash plume is blowing to the SSE, S with a lesser amount to the SSW. The size of the eruption and the amount of ash appear to be like those of the summer 1980.

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ERUPTION UPDATE

MARCH 20, 1982  
1:59 AM, PST

There was another pulse of ash from St. Helens at 0140. It has been reported to 18,000 feet by observers and is reportedly blowing to SSE. We will provide more information when we have it.

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ERUPTION UPDATE

MARCH 21, 1982  
9:00 AM, PST

There is a new lobe being added to the SE side of the lava dome in the crater of Mount St. Helens. The new extrusion began during the night. Seismicity and tilt are now following patterns observed during other recent periods of dome growth.

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ERUPTION UPDATE

MARCH 24, 1982  
5:30 PM, PST

Growth of the new dome lobe has slowed significantly over the past 2 days, but rates of deformation on the north side of the dome have increased over the same period. Until additional measurements are made, it would be premature to declare this eruption over. Seismometers are recording decreasing numbers of avalanches as growth of the new lobe slows.

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ERUPTION UPDATE

APRIL 4, 1982  
9:55 PM, PST

Seismicity is continuing at a moderate to high level, and some eruptive activity appears to be continuing. Clouds prevent visual observations.

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ERUPTION UPDATE

APRIL 5, 1982  
1:00 AM, PST

Seismicity still continues at moderate to high levels. Fluctuations in seismicity correspond to pulses of gas and ash, the largest of which began at 12:37 AM and rose to a maximum of about 32,000 feet.

There does not appear to be much ash in the plume but minor ashfall was reported earlier tonight at Packwood. No increases have been reported in river levels.

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ERUPTION UPDATE

APRIL 5, 1982  
6:30 PM, PST

Seismicity is continuing at a moderate to high level. The status of the volcano remains unchanged since the previous advisory (1AM, 4/5/82). Some additional dome-growth and/or small-scale explosive activity is likely; larger explosive activity is less likely but cannot be ruled out.

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ERUPTION UPDATE

APRIL 6, 1982  
9:15 AM, PST

Another new lobe is being added to the dome. This reduces the immediate likelihood of larger explosive activity, but small, intermittent gas and ash pulses may continue to occur.

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ERUPTION UPDATE

APRIL 12, 1982  
3:15 PM, PST

Seismicity, deformation and gas emissions at St. Helens have returned to low levels, indicating that the eruption that began on 3/19/82 is over.

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EXTENDED OUTLOOK ADVISORY

MAY 11, 1982  
9:40 PM, PDT

Shallow earthquakes and deformation in the crater area are increasing as they have before previous eruptions. Seismicity has been increasing gradually for the last two days, and the dome has been swelling at rates like those observed within a week of recent eruptions. An eruption is likely to begin within the next week, possibly within the next few days. From the signs thus far, the eruption will probably include dome growth, with or without some explosive activity.

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ERUPTION ALERT

MAY 13, 1982  
11:00 PM, PDT

Shallow volcanic earthquakes that warn of eruptions are becoming more numerous. Rates of deformation of the dome and crater floor have more than doubled today. On this basis, we predict that the eruption will begin within the next 36 hours, possibly within the next 12 hours. As noted in the extended outlook advisory, we expect that the eruption will consist primarily of dome growth, with or without minor explosive activity.

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ERUPTION UPDATE

MAY 14, 1982  
5:30 AM, PDT

Geologists on an early morning flight report that the expected eruption has begun. Incandescent avalanches are occurring on the NE side of the dome, probably indicating new dome growth. A steam plume containing a small amount of dust from the avalanches is rising above the crater rim and is drifting a short distance off to the NE.

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ERUPTION UPDATE

MAY 20, 1982  
3:25 PM, PDT

Seismicity, deformation and gas emissions at St Helens have returned to low levels, indicating that the eruption that began 5/14/82 is over.

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EXTENDED OUTLOOK ADVISORY

JULY 30, 1982  
1:00 PM, PDT

Seismicity and rates of deformation of the dome and crater floor have increased over the past week. These increases are similar to those observed before recent eruptions. If current trends continue, an eruption will probably begin within the next three weeks. We predict that the eruption will consist primarily of dome growth but, as with all dome growth, minor explosive activity is also possible.

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VOLCANO ADVISORY

AUGUST 16, 1982  
11:30 AM, PDT

Seismicity and deformation in the crater are now accelerating. We predict that an eruption will begin within the next 4 days, possibly within the next 2 days. We anticipate that the eruption will consist primarily of dome growth, but as with all dome growth, minor explosive activity is also possible.

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ERUPTION ALERT

AUGUST 17, 1982  
6:55 AM, PDT

Seismicity and rates of deformation in the crater have accelerated sharply within the last 24 hours, following a pattern observed shortly before other recent eruptions. Based on this comparison, the expected eruption will probably begin within the next 24 hours.



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ERUPTION ALERT UPDATE

AUGUST 18, 1982  
7:45 AM, PDT

Seismicity and deformation of the dome and crater floor remain high, but are following a slightly different pattern than previously observed. The west and southwest sides of the dome were growing upward and outward at rates of about 10 meters/day by yesterday afternoon, and numerous rockfalls from that part of the dome indicate that this expansion of the dome is continuing. In a technical sense the eruption has begun; because the dome is already growing internally – a phenomenon called endogenous dome growth. On the other hand, we have not seen any discrete event yet, for example an explosion, a change in the character of the deformation or seismicity, or an increase in gas emissions, that in other recent eruptions has signaled the onset of the main part of those eruptions. Since the seismicity and deformation are continuing at high levels, we still expect lava to eventually work its way through the dome and to be extruded as a new lobe – the phenomenon called exogenous dome growth that has occurred in all of the other recent eruptions. One can think of the dome as a berry pie in the oven – the pie is expanding, and eventually the crust will break and a delicious ooze will appear on the surface.

*(Short-form for USFS call-down ---- Seismicity and deformation of the dome and crater floor remain high, but are following a slightly different pattern than previously observed. The dome is already growing internally, but we have not seen any discrete event yet, for example an explosion, a change in the character of seismicity or deformation, or an increase in gas emissions, that in other recent eruptions has signaled the onset of the main part of those eruptions. We still expect lava to eventually work its way through the dome to be extruded as a new lobe on the surface of the dome.)*

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ERUPTION UPDATE

AUGUST 18, 1982  
7:15 PM, PDT

Lava finally broke through to the top of the dome this morning, and a new lobe is flowing slowly onto the western and southern sides of the dome. This extrusion is accompanied by many rockfalls, and dust from these rockfalls often rises above the crater rim. The current activity is like that of other recent episodes of dome growth.

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ERUPTION UPDATE

AUGUST 19, 1982  
8:00 AM, PDT

The new lobe of the dome is continuing to grow freely, and earthquake activity has declined. The chances for serious explosions have declined, though minor ash and dust clouds may rise above the crater rim.

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ERUPTION UPDATE

AUGUST 23, 1982  
8:45 PM, PDT

Deformation and gas emissions have returned to their background levels, so this eruption is essentially over. Minor sagging and spreading of the new lobe may continue for a few days, accompanied by occasional rockfalls and dust plumes.

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VOLCANO ADVISORY

FEBRUARY 3, 1983  
8:00 AM, PST

Two small explosions occurred in the crater at Mount St. Helens last night at 11:39 PM (2/2/83) and 2:56 (2/3/83), sending steam plumes with small amounts of ash to approximately 20,000 feet. A pre-dawn flight (2/3/83) reported that one or both of these explosions melted snow on the east side of the crater, and generated a small mudflow. Field crews are enroute to the mountain to confirm this observation. These events are similar to small explosions or steam bursts in mid-December 1980, March-August 1981, and May-July 1982.

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VOLCANO ADVISORY UPDATE

FEBRUARY 3, 1983  
5:30 PM, PST

Last night's steam bursts from the top of the dome spread a thin layer of ash over areas northwest of Mount St. Helens. They also caused a small snow and ice avalanche;, melted some snow, and generated a small mudflow. A small amount of muddy water reached Spirit Lake, but it did not affect the debris dam or the pumping operation. A smaller steam burst at 3:44 PM today rose only to the crater rim. These events originate near the surface of the dome, are not preceded by significant seismicity or ground deformation, and do not pose serious hazards outside the crater.

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EXTENDED OUTLOOK ADVISORY

FEBRUARY 5, 1983

9:30 PM, PST

Rates of seismic energy release, gas emission, deformation of the dome and crater floor, and glow from the dome, have increased over the past week. If current trends continue, an eruption will begin within the next two weeks, likely within the next week. Relatively small explosions and rockfalls from the dome may also continue; they are of shallow origin and their relationship to the increase in seismicity, deformation, and gas emission is not clear.

Several differences in the present precursors compared to those of recent eruptions suggests that this eruption may include some explosive activity along with dome growth, a lava flow (non-hazardous) is a less likely possibility. Any explosive activity may cause rapid snowmelt and mudflows that could flow into Spirit Lake or down the North Toutle. At present, we do not anticipate an eruption that would jeopardize the Spirit Lake impoundment.

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VOLCANO ALERT

FEBRUARY 7, 1983  
12:40 PM, PST

A new dome lobe has been reported by our aerial observer. Ground crews will attempt to confirm this report and determine more about what events may follow. No hazardous explosive activity has occurred as of this time.

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VOLCANO ALERT UPDATE

FEBRUARY 7, 1983  
8:30 PM, PST

A new lobe is growing on the east side of the dome, from the site of the small explosions on the night of February 2-3. The short-term likelihood of significant explosive activity is now reduced, but it will be a few days or more before we can be confident that no significant explosions will occur. Minor explosions and rockfalls like those of the past several days may continue.

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ERUPTION ADVISORY

MARCH 1, 1983  
3:30 PM, PST

The February 1983 eruption can finally be considered over. Seismicity, ground deformation, and gas emissions have declined significantly from their levels early in the eruption. Although they have not returned to a completely quiet state, they are low

enough and steady enough that we think they are the tail-end of this latest eruption, rather than an indication of renewed activity. Some further rockfalls and small ash emissions are likely, but these will not pose hazards outside the crater.

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EXTENDED OUTLOOK ADVISORY

MARCH 6, 1983  
4:00 PM, PST

Seismicity is increasing once again, and is now at a rate like that observed in the early stages of buildup toward previous eruptions. Ground deformation may also be increasing, but poor weather has prevented a clear determination of the rates. Early changes in both seismicity and deformation are like those observed before predominantly non-explosive dome growth. We will issue a prediction if seismicity continues to increase and/or if an increase in rates of ground deformation can be confirmed.

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EXTENDED OUTLOOK ADVISORY

MARCH 8, 1983  
3:00 PM, PST

Current rates of seismicity suggest that an eruption will begin sometime within the next three weeks. Poor weather continues to prevent ground deformation measurements that would aid in making a more precise estimate of when the expected eruption will begin. We will update this prediction if warranted by changes in the pattern of seismicity or by deformation measurements.

*(Supplemental statement for USFS, WA DES, and COE ---In addition to our prediction of 3/8/83 that an eruption will begin within three weeks, we wish to call several other points to your attention.*

1) *Explosive activity of a scale large enough to threaten the personnel of the pumping operation is unlikely at this time, assuming that personnel avoid stream channels leading from the crater. It would require an explosive eruption of the scale of June 12, 1980 to threaten those personnel, an event that we consider unlikely at this time; rather, we expect that this next eruption will be of the same predominantly non-explosive dome-building type as other recent eruptions.*

2) *We think that the chance of explosive activity that would pose hazards outside the crater is highest at the onset of an eruption. If this is correct, the chance of significant explosive activity is reduced even further once a new dome lobe begins to grow. We also think that because of the short time since the February 1983 eruption, the chance of significant explosive activity in this eruption is lower than it was at the onset of the February eruption.*

3) *Although we think that explosive potential decreases once a new dome lobe begins to grow, it is possible for that potential to increase once again at some time later*

*in an eruption. To date, no important explosions have occurred at Mount St. Helens once dome growth has begun, but the pattern at other domes is not always so simple. Our prediction of explosive potential is based primarily on our assessment of eruption precursors and the behavior of the volcano over previous months. We may not have enough basis in patterns from previous eruptions to modify that prediction during an eruption.*

*4) Uncertainties about the starting date of this coming eruption are relatively high, because (a) owing to poor weather, we have virtually no measurements of ground deformation or gas emissions and no visual observations of the volcano since March 3, (b) seismicity itself is fluctuating, making it difficult to define a curve on which to base a prediction, and (c) this eruption follows closely on the heels of the February eruption, and we therefore do not know whether there will be another increase in seismicity before this eruption begins. We are less certain than usual that a significant, recognizable increase in seismicity will occur before the eruption, especially in enough time for pumping personnel to leave the area before the eruption commences. There is a reasonable chance that the character of the seismicity may simply change, and new or renewed dome growth begin, before we can issue any more precise predictions.)*

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ADVISORY TERMINATION

MARCH 29, 1983

1:30 PM, PST

Seismicity has declined since we issued our extended outlook advisory on March 8, and ground deformation continues at a nearly constant rate. Other measurements indicate that slight changes continue. None of our measurements, however, indicates that an eruption is imminent. Some changes were observed on the surface of the dome during March, but poor weather has prevented detailed observations. This is the last day of the 3 week period indicated in our extended outlook advisory, and we have no basis for extending that advisory.

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INFORMATION UPDATE

APRIL 19, 1983

1:00 PM, PST

In our advisory of March 29, we indicated that some changes had occurred on the dome, but that these were difficult to confirm due to poor weather. In the past week, clear weather has allowed measurements that show elevated gas emissions, increased rockfalls from the dome, and continuing deformation of the dome. The eastern side of the dome is growing slowly and probably has been since early March, accompanied by low-level seismic activity. It remains unclear whether new material has been extruded onto the surface of the dome (i.e. exogenous dome growth) or if all growth has been internal (i.e.

endogenous dome growth).

Continued growth of the dome has made its eastern flank less stable, and has resulted in numerous rockfalls from the February 1983 lobe onto the crater floor. Rockfalls do not normally pose hazards beyond the crater, but it is conceivable that collapse of a large portion of the February lobe could cause an explosion, rapid snowmelt, and relatively small mudflows. Rockfalls and related phenomena are generally unpredictable, but are more likely to occur when the dome is actively growing.

The daily emissions of gas and ash, which have been widely visible recently during clear weather, come mainly from the top of the dome and probably occur when groundwater is heated beneath the dome and flashed into steam. The relationship of these emissions to the continuing growth of the eastern part of the dome is not entirely clear at this time. Such gas and ash emissions do not pose serious hazards outside the crater, and result in only light dustings of ash in areas downwind from the volcano.

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INFORMATION UPDATE

MAY 5, 1983  
10:00 AM, PDT

Our statement of April 19 indicated that the eastern side of the dome had been growing slowly, probably since early March. It was, however, unclear whether new material had been extruded onto the surface (a process commonly termed an eruption) or whether all growth had been internal (endogenous growth), simply disrupting the surface of the dome and inflating it much like a balloon. There is a complete gradation between the two types of activity, and when rates of growth are relatively slow, as they have been, it can be difficult to determine with certainty whether new lava has actually reached the surface of the dome.

Observations since April 19 demonstrate that the east, particularly the northeast, sector of the dome has continued to be mobile, resulting in outward movement of the northeast margin of the dome by as much as 1 m per day. Numerous rockfalls have occurred because of instabilities caused by this mobility. Sometime between late April 29 and early May 4, new lava appeared high on the northeast part of the dome. This lava was pushed very slowly from a small spreading center, typical of, but smaller than, those accompanying growth of earlier lobes. The appearance of new lava on the surface means that an eruption in the usual sense of the term has and perhaps still is taking place. We emphasize that this extrusion is simply a natural outgrowth of the activity of the past two months.

Seismicity continues at a slightly elevated level. Emissions of gas and ash are expected to continue, as are rockfalls. Hazards remain as stated on April 19, although the chances of significant mudflows have lessened slightly owing to decrease in the snowpack during recent warm weather.

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INFORMATION UPDATE

JUNE 1, 1983  
3:00 PM, PDT

The dome is continuing to grow at about the same rate as it has for the past 4 months. Most of the growth is internal (endogenous), but the extrusion (exogenous growth) that began about May 1 is also continuing. Nearly all growth is occurring on the eastern side of the dome. Snow in the crater is giving way to summer, and mudflow hazards are correspondingly reduced.

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INFORMATION UPDATE

AUGUST 1, 1983  
3:00 PM, PDT

The lava dome in the crater of Mount St. Helens continues to grow. Lava is being added to both the interior and the exterior of the dome; the most rapid growth is on the northeast side of the dome. Seismicity, ground deformation, gas emissions, and the rates of extrusion and intrusion fluctuate slightly from week to week and from month to month; activity in June and July was slightly less than that during May. The most rapid growth produces extrusions; slower growth is accommodated as intrusions within the dome. Growth since February of this year has been more continuous but at a slower daily rate than that during the eruptions of 1981-82, which typically lasted for several days and which were separated by weeks or months of inactivity. Despite the slower rate, the more continuous activity results in an average rate of growth about the same as it has been since the initial appearance of the dome in October, 1980. Small rockfalls and occasional gas-and-ash emissions are the most visible aspects of the current activity; most rockfalls are from the actively moving segment. Large rockfalls or small pyroclastic flows could also occur, but are much less likely than smaller events.

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INFORMATION STATEMENT

SEPTEMBER 13, 1983  
4:00 PM, PDT

Routine measurements in the crater of Mount St. Helens show that since late August the rate of swelling of the lava dome has been increasing appreciably, particularly on the south and southeast flanks. Meanwhile, the extrusion of the active lobe of lava on the northeast side of the dome continues at a roughly constant rate. Rockfalls and small avalanches continue from the margins of this active lobe. Emissions of gas and ash continue to occur from the summit of the dome several times each day; the largest of

these produce plumes that rise to a few thousand feet above the crater rim. Seismicity remains at levels slightly elevated above background. The exhalation rate of sulfur dioxide gas has not changed significantly.

The increasing swelling suggests that the rate at which magma is entering the dome is increasing while the rate of extrusion is not. The increase in swelling resembles behavior that preceded eruptions in 1981 and 1982. This suggests either that a new lobe of lava might be extruded from some other part of the dome, or that the rate of extrusion of the presently active lobe might increase. It is not yet possible to anticipate when such a change might occur, but the situation is being closely monitored; information will be updated as appropriate. The changes being observed now do not suggest any immediate increase in the degree of hazard except within and near the crater.

*(Short form for USFS call-down ----- Measurements in the crater of MSH show that the rate of swelling of the lava dome has been increasing. Meanwhile, extrusion of the active lobe of lava has continued at a constant rate. A possible result might be either extrusion of a new lobe or an increase in the extrusion rate of the presently active lobe, but it is not yet possible to anticipate when such a change might occur. A more detailed statement can be obtained by calling (206) 696-7914.)*

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VOLCANO ADVISORY

OCTOBER 1, 1983  
7:00 PM, PST

Since the last information statement on September 13, 1983, the rate of spreading on the southeast and south sides of the lava dome in the crater of Mount St. Helens has continued to increase. For more than two weeks the rate of spreading increased gradually, but since September 28 the rate has increased more rapidly and is now 3-4 times that on September 13. If current trends continue, the currently ongoing eruption will probably be modified by a new extrusion beginning within the next ten days, possibly within five days. The most likely behavior will be quiet extrusion of lava, but some explosive activity more vigorous than the frequent gas and ash emissions is possible. Hazards have increased slightly within and near the crater, but have not increased significantly beyond the immediate vicinity of the crater.

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ERUPTION ADVISORY

OCTOBER 11, 1983  
10:00 AM, PST

The anticipated change in the ongoing eruption at the lava dome of Mount St. Helens has quietly begun. Lava is emerging from a new source near the head and south margin of the active lobe. The new extrusion probably began late last week, but could not be



confirmed by ground observations until October 10. Other portions of the active lobe continue to move, at somewhat slower rates than previously. Seismicity remains slightly elevated, and gas and ash emissions continue to occur, sometimes several times per day.

*(Long form -- The anticipated change in the ongoing eruption at the lava dome of Mount St. Helens has quietly begun. Lava is emerging from a new source near the head of the active lobe, raising a ridge along the southern margin of this lobe, east of the central crater of the dome. A point on this new, growing ridge is now the highest point of the dome, standing about 10 meters higher than the previous summit. The new extrusion probably began late last week, but could not be confirmed by ground observations until October 10. Other portions of the active lobe continue to move about 1/2 meter per day, somewhat slower than previously. The maximum rate of spreading of the south and southeast flank of the lava dome has become stable at about one meter per day. Seismicity remains slightly elevated, and gas and ash emissions continue to occur, sometimes several times per day.)*

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INFORMATION SUPPLEMENT

DECEMBER 30, 1983

Since the last Eruption Advisory of October 11, the lava dome in the crater of Mount St. Helens has continued to grow. New lava is being added to both the interior and the exterior of the dome. The southeast sector of the dome continues to be the most mobile portion of the dome, but its rate of spreading decreased in November. Beginning in mid-December, increased rates of spreading, incandescence and ground cracking have been observed in the north and northeast sectors of the dome. Seismicity has generally been slightly elevated, occasionally increasing to moderate levels for brief periods of time. The rates of gas emissions have been higher for the past 3 weeks than during November. Gas and ash events continue to occur several times each day, as they have for many months.

Fresh snow covers most of the crater floor to depths of at least 15 feet or more. About 12 feet of snow blankets the floor north of the dome. More than 50 feet of snow from past winters underlies the fresh snow in some parts of the inner crater. Rockfalls and small explosions do not normally pose hazards beyond the crater, but volcanically-induced rapid snowmelt could generate mudflows during the current dome-building activity.

The recent resumption of activity in the northeast part of the dome is the latest episode in the continuous dome-building eruption that has characterized Mount St. Helens since February 1983. This eruption contrasts with the short-lived, episodic dome growth eruptions that were observed from 1980-1982. The overall rate of lava extrusion in the crater, roughly 1 million cubic meters a month, has not changed since October 1980. The chemical composition of the new lava closely resembles that of the dacitic lava of previous dome growth episodes.

INFORMATION STATEMENT

JANUARY 31, 1984

Measurements in the crater of Mount St. Helens show significant increases in the rate of spreading of the north and west sides of the dome over the last 10 days, and rates are now higher than at any time in the past year. Movement of the southeast sector, previously the most active part, has slowed and is now barely perceptible. Increased incandescence on the north and west sides of the dome and ground cracking on top of the dome have also been observed. Emission rates of sulfur dioxide gas have decreased in the last 10 days. Gas and ash events continue to occur several times each day, but have become more vigorous. Seismicity has generally been slightly elevated, occasionally decreasing to background levels. A crater seismometer and field observations indicate an increased number of small earthquakes and a shift in location from the south side of the dome to the north side.

The recent changes in activity in the north sector of the dome have increased the chances of a large rockfall or small lateral explosion from the north side of the dome. Rapid snowmelt from such activity could produce a mudflow north of the crater. More extensive mudflows could result if the snowpack thickens.

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VOLCANO ADVISORY

FEBRUARY 4, 1984  
7:45 PM, PST

Shallow seismicity and ground deformation near the lava dome of Mount St. Helens have accelerated since our previous statement of January 31. Many small earthquakes are occurring within and just beneath the dome. Much and possibly all of the dome and some parts of the crater floor are deforming. It appears that magma is rising beneath the dome at an increased rate.

The present activity resembles the preliminary signs of the episodic, dominantly non-explosive 1981-82 eruptions, superimposed on the continuous dome growth that began in February 1983. If the analogy to the 1981-82 eruptions is valid, we might expect a pulse of magma to rise close to or onto the surface of the dome within the next few days. A pulse rising through the dome would further deform it and increase the chance of a landslide or small explosion.

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VOLCANO ALERT

FEBRUARU 5, 1984  
9:45 PM, PST

Frequent earthquakes and rapid expansion of the lava dome indicate that an eruptive pulse is likely to begin within the next 48 hours, probably within the next 24 hours. Similarities to seismicity before the eruption of March 19, 1982 suggest that an explosive onset is likely. Such an explosion, were one to occur, could affect areas within a few miles of the dome but would probably not pose hazards to nearby communities.

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ALERT UPDATE

FEBRUARY 6, 1984  
9:10 PM, PST

At 8:16 PM a small landslide from the east side of the lava dome reached the east crater wall and has caused minor snow melt. No mudflow has occurred. A plume with a little ash rose to 13,000' and is drifting to the east. This probably marks the onset of the expected eruptive pulse; further activity including rock avalanches, slow lava extrusion, and small explosions may follow over the next few days.

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ALERT UPDATE

FEBRUARY 9, 1984  
1:00 PM, PST

Since our previous statement of February 6, 1984, signs of unrest at Mount St. Helens have changed significantly. Earthquake activity continued to increase until the afternoon of February 7. When last observed on February 7, radial cracks in the dome were still widening and swelling of the uppermost part of the dome was still accelerating. A part of the top of the dome was intensely disrupted to form an elongate mound; as this mound grew, an earlier summit mound located 100 yds to the east of the elongate mound subsided. SO<sub>2</sub> gas emission increased on February 6 and 7. Since the evening of February 7 clouds have prevented field observations and measurements, but earthquake activity has decreased and seismic signals caused by rockfalls from the dome have become more frequent.

In the past, such increases in seismicity and swelling have accompanied the rise of magma high into the dome; rockfall seismic signals such as are occurring now have previously accompanied extrusion of lava onto the surface of the dome. Whether extrusion is actually in progress cannot be confirmed until the weather permits visual observations.

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VOLCANO ADVISORY

FEBRUARY 10, 1984  
6:30 PM, PST

Late this afternoon under conditions of poor visibility, a USGS field crew saw what appears to be a new lava extrusion on top of the dome.

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VOLCANO ADVISORY

MARCH 27, 1984  
9:30 PM, PST

Frequent earthquakes and rapid swelling of the dome indicate that a new episode of dome growth is beginning. Current growth is internal; if magma continues to rise through the dome, lava will be extruded onto the surface within a few days. As with each dome building eruption, rockfalls and small explosions are possible; these are unlikely to pose hazards outside the crater and immediate vicinity.

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VOLCANO ADVISORY

MARCH 29, 1984  
7:00 AM, PST

Landslides from the lava dome, possibly accompanied by a small explosion, occurred about 3:20 this morning. Minor snow melt occurred in the crater, but no significant mud flow extended beyond the crater. Lava is now being extruded onto the top of the dome. As during previous episodes of lava extrusion, hazards are largely restricted to the crater.

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INFORMATION STATEMENT

MAY 14, 1984  
10:20 AM, PDT

A gas and ash emission at about 0935 hrs sent a small amount of ash to about 28,000', the ash is drifting NE. A small mudflow in the North Toutle is passing Elk Rock as of about 1020 hrs.

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INFORMATION STATEMENT

MAY 26, 1984  
10:05 AM, PDT

A gas and ash plume at 8:14 A.M. rose to about 22,000 feet and carried a small amount of ash to the east. A small mudflow entered Spirit Lake; little or no flow entered the North Toutle. Both the plume and flow were smaller than those of May 14, 1984. No further statement is anticipated.

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VOLCANO ADVISORY

JUNE 18, 1984  
09:20 AM PDT

A new lobe is growing on the west side of the lava dome, within a notch that formed during the small explosion of May 14, 1984. Lava extrusion began after relatively small increases in seismicity and ground deformation.

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ADVISORY CANCELLATION

JULY 10, 1984  
09:30 AM, PDT

The episode of dome growth that began on June 17 has ended. Lava extrusion occurred from June 17 to about the end of June: internal dome growth began in late June, peaked on or about July 1, and has gradually slowed since that date. Gas and ash emissions and small rockfalls from the dome and crater walls are likely to continue, but pose few hazards outside the crater.

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EXTENDED OUTLOOK ADVISORIES

SEPTEMBER 5, 1984

Seismicity, deformation of the crater floor and lava dome, and SO<sub>2</sub> gas emissions are increasing slowly at Mount St. Helens. The pattern of activity through yesterday is similar to the pattern observed one to two weeks before previous episodes of rapid dome growth. Thus if current trends continue, rapid dome growth (internal growth, possibly accompanied by lava extrusion) is likely within two weeks. As in previous episodes of dome growth, small explosions are possible but no large explosion is suggested.

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VOLCANO ADVISORY

SEPTEMBER 7, 1984  
10:30 AM, PDT

The numbers of small earthquakes and rockfalls in the crater of Mount St. Helens have climbed to levels comparable to those observed during previous periods of very rapid dome growth. The latest deformation measurements, made on Wednesday morning, showed rapidly accelerating deformation of the north side of the dome. Weather is

preventing field observations, but the evidence on hand suggests rapid dome expansion or extrusion at this time.

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VOLCANO ADVISORY

SEPTEMBER 9, 1984  
9:30 AM, PDT

The number of rockfalls and small earthquakes in the crater of Mount St. Helens increased sharply last night (Sept. 8-9). Observers in the crater on Saturday afternoon (Sept. 8) found accelerating deformation but no new lava extrusion as of that time. Glowing cracks in the dome, observed last night, also indicated significant deformation of the top and north side of the dome. Similar rapid growth of the north side of the dome in late March 1984 led to a landslide from the dome, and such landslides can trigger small explosions. Hazards now, as then, are largely restricted to the crater.

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VOLCANO ADVISORY UPDATE

SEPTEMBER 11, 1984  
9:30 AM, PDT

The northern part of the lava dome has grown substantially, by internal expansion. Growth was especially rapid late Sunday night and early Monday morning. Since that time, the rate of dome growth has slowed. However, slower dome growth continues, so rockfalls are likely to continue for at least several days. A large collapse is less likely now than it was during the most rapid internal expansion of the dome, but such collapse remains possible as long as the dome continues to grow.

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VOLCANO ADVISORY UPDATE

SEPTEMBER 12, 1984  
1: 00 PM, PDT

A new extrusion (lobe) has been sighted high on the northwest side of the lava dome. Lava that had intruded into the northern part of the dome, and caused remarkably rapid internal dome growth, has finally leaked out onto the surface. Lava extrusion supports the previous assessment of declining hazards at Mount St. Helens provided that no additional lava is intruded into the dome.

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ADVISORY CANCELLATION

SEPTEMBER 14, 1984

2:00 PM, PDT

The latest episode of dome growth at Mount St. Helens has ended, the volcano is quiet at this time, and the advisory of September 9 is cancelled.

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VOLCANO ADVISORY

MAY 20, 1985  
7:30 PM, PDT

Recent changes at Mount St. Helens suggest that renewed eruptive activity will begin within the next two weeks, possibly within the next few days. Seismicity has increased slowly over the past week and more rapidly within the past 24 hours. Rates of ground deformation have also increased, and the first vigorous gas emissions since September occurred on Friday, May 17.

Activity thus far is generally similar to that which preceded previous dome-building eruptions, and another dome-building eruption is likely. However, previous dome-building eruptions after several months of quiet began with small to moderate-sized explosions, and similar explosions are also possible.

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VOLCANO ALERT

MAY 25, 1985  
9:30 AM, PDT

Data from Mount St. Helens during the past 24 hours suggest that the anticipated eruptive activity will begin within the next 48 hours. The number of small earthquakes beneath the dome is increasing, and low frequency earthquakes that immediately precede and accompany extrusions are becoming more numerous. The dome continues to deform rapidly, and the deformation pattern now suggests that magma has nearly reached the surface. Observations at 12:30 AM PDT today detected increased glow from cracks on the dome.

Similar changes immediately preceded past extrusions on the dome, so another extrusion is likely. Small explosions of ash emissions, with effects mostly confined within the crater, are also possible. An explosion could melt snow rapidly and cause a small mudflow out of the crater.

Our current assessment is that the activity is unlikely to be hazardous outside the restricted area.

*(Short-form issued at 10:10 AM at Washington DEM's request for NAWAS : Overnight changes at Mount St. Helens suggest that magma is now close to the surface and an*

*extrusion will begin within the next 48 hours. A small explosion and mudflow may accompany the extrusion, but are unlikely to pose hazards outside the restricted area.)*

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ALERT UPDATE

MAY 27, 1985  
9:30 AM, PDT

Seismicity and deformation and incandescence of the lava dome have increased since our alert of 0930 hrs, 25 May. Magma is intruding high into the dome and the dome is growing internally. As of 0415 hrs this morning no lava extrusion was visible, and since then clouds have prevented further observations. Our alert of 25 May remains in effect.

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ALERT UPDATE

MAY 29, 1985  
3:00 PM, PDT

The dome of Mount St. Helens is growing internally. Seismicity has increased over the last several days to an extremely high level. Visual observations of the dome and deformation measurements in the crater have not been made since the afternoon of May 27, owing to poor weather. At that time, an east-trending arcuate zone of cracking crossed the southern part of the dome, but no new lava was seen at the surface.

The prolonged, extremely high level of the seismicity makes this sequence different than previous sequences that preceded the predominantly dome building eruptions of 1981-1984. Earthquakes with magnitudes as large as 2.5 to 2.8 are now occurring every few minutes at depths as deep as a kilometer beneath the dome. Previous eruption sequences have been characterized by only a few earthquakes of magnitude 2.5, and earthquake depths were typically near the surface. Extremely high rates of seismicity like those now being recorded at Mount St. Helens have previously lasted for less than a day.

The changes in the seismicity pattern for this eruption sequence coupled with the lack of crater observations because of the poor weather makes it especially difficult to predict the course of this eruption. The dome may continue to enlarge internally for some time, and magma may or may not eventually extrude onto the surface. An explosion could occur at any time during the current period of unrest.

Despite the uncertainties, we anticipate that hazards will be largely confined to the restricted area.

*(Short form: The dome of Mount St. Helens is growing internally. Seismicity has increased over the last several days to an extremely high level. Changes in the seismicity pattern for this eruption sequence and inclement weather make it especially difficult to*



*predict the course of this eruption. The dome may continue to enlarge internally, and lava mayor may not extrude onto the surface. An explosion could occur at any time during the current period of unrest, but we anticipate that hazards will be largely confined to the restricted area.)*

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VOLCANO ADVISORY

JUNE 5, 1985  
11:00 AM, PDT

Seismic activity at Mount St. Helens has declined to moderate levels. Hazards are less now than they were several days ago. However, small shallow earthquakes and rockfalls indicate continued activity within the dome. Field observations have not been made since June 3 because of inclement weather.

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ADVISORY CANCELLATION

JUNE 18, 1985  
10:00 AM, PDT

The current volcano advisory is cancelled. Deformation of the dome has declined to very low levels and seismic activity is very low indicating that endogenous growth of the dome has stopped.

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INFORMATION STATEMENT

MAY 6, 1986  
1:00 PM, PDT

More than 50 steam and ash explosions have occurred on the dome at Mount St. Helens during the last 3 weeks. Seismicity has increased from slightly elevated levels at the end of April to moderate levels today. Most monitoring equipment on the dome has been damaged by the explosions and no longer operates. One remaining tiltmeter on the dome shows gradually accelerating tilt. Other deformation measurements have been hampered by inclement weather, inaccessibility of the dome because of the explosions, and loss of many targets. Hazards from explosions are most likely to be restricted to the crater and flanks of Mount St. Helens. However, small mudflows caused by explosions in the crater may flow into the North Fork Toutle River, and areas downwind from the volcano may occasionally be dusted by small amounts of ash such as has occurred recently.

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VOLCANO ADVISORY

MAY 7, 1986  
3:00 PM, PDT

Seismicity at shallow depths beneath the lava dome of Mount St. Helens has increased to a high level since our previous statement of May 6. Both remaining tiltmeters show accelerating tilt on the north flank of the dome and nearby crater floor. On this basis, we expect a magmatic event, probably of the dome building variety but possibly including a more vigorous explosion, to occur within the next three weeks. Field crews have not been able to get to the crater since April 29, owing to inclement weather. When deformation measurements in the crater are made, we will update this advisory. Hazards are still most likely restricted to the crater and flanks of Mount St. Helens, which would create hazards in the North Fork Toutle River drainage.

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VOLCANO ADVISORY UPDATE

MAY 8, 1986  
9:00 AM, PDT

Seismicity and tilt have increased greatly since the advisory of May 7. We now expect a magmatic event, possibly including explosive activity, within the next week, probably in the next few days. Hazards remain as stated in the previous advisory.

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ADVISORY UPDATE

MAY 9, 1986  
2:00 PM, PDT

Yesterday afternoon seismicity declined, seismic signal character changed, crater-floor tilt essentially stopped, and measured rates of deformation of the north side of the dome decreased. Similar changes in the past have occurred at the time new lobes were extruded on the surface of the dome. Steam obscured the top of the dome yesterday and crews have not been able to get to the crater today, so we have not been able to confirm if a new lobe is present. Hazards remain as in the previous advisory.

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ADVISORY UPDATE

MAY 14, 1986  
2:00 PM, PDT

A new lava extrusion (lobe) has been sighted on top of the dome. Seismicity has decreased from moderate to slightly elevated levels. Small earthquakes and rockfalls indicate continued activity within the dome. As with past dome building eruptions, rockfalls and small explosions are possible; these are unlikely to pose hazards outside the

crater.

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ADVISORY CANCELLATION

MAY 20, 1986  
11:00 AM, PDT

Seismicity, deformation, and gas emissions have decreased markedly since extrusion of a new lobe on the dome. Consequently, the earlier advisories are cancelled.

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EXTENDED OUTLOOK ADVISORY

OCTOBER 16, 1986  
6:00 PM, PDT

Seismicity within the crater and deformation rates on parts of the dome are increasing slowly at Mount St. Helens. These changes are similar to those that preceded earlier episodes of rapid dome growth. If current trends continue, another episode is likely to begin within the next 3 weeks. As in previous episodes of dome growth, small explosions are possible but hazards will likely be confined to the crater.

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VOLCANO ADVISORY

OCTOBER 19, 1986  
10:00 AM, PDT

Seismicity and deformation rates have continued to increase since the Extended Outlook Advisory of October 16. We now expect an episode of rapid dome growth to begin during the next 2 to 10 days. As in previous episodes, small explosions and ash plumes, with effects mostly confined to the crater, may accompany the dome growth.

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ADVISORY UPDATE

OCTOBER 20, 1986  
7:00 PM, PDT

Rates of seismicity and deformation of the dome have increased substantially since yesterday's Advisory. Deformation is most intense on the western part of the dome where many new cracks and rockfalls were observed today. If current trends continue, the expected episode of rapid dome growth will begin within the next 5 days, most likely within the next 3 days. Hazards remain as stated in yesterday's Advisory.

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ADVISORY UPDATE

OCTOBER 22, 1986  
10:30 AM, PDT

A new extrusion (lobe) has been sighted high on west central part of the lava dome. Although the level of seismicity remains high, the new lobe appears stable at this and collapse due to internal expansion of the dome is unlikely. Hazards remain as previously stated.

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ADVISORY CANCELLATION

OCTOBER 27, 1986  
9:00 AM, PST

Seismicity, deformation, and gas emissions have decreased markedly since extrusion of a new lobe on the dome last week. Consequently, the earlier advisories are cancelled.

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INFORMATION UPDATE

AUGUST 25, 1989  
1700 PDT

Two episodes of sustained seismicity beneath Mount St. Helens occurred within the past 24 hours. Frequent small shallow earthquakes followed these events and are continuing. No other changes to the lava dome or crater floor were observed today. This seismicity represents an increase in the level of activity since October 1986; its significance in terms of future activity is uncertain.

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INFORMATION STATEMENT

NOVEMBER 5, 1990  
0545 PST

Seismic signals at Mount St. Helens increased abruptly at 0207 PST. The strong seismic signals continued for about 6 minutes and then gradually returned to background over the next 2-3 hours. Pilots reported a plume to an altitude of 25,000-30,000 feet, and the Skamania County Sheriff reports light ashfall south of Mount St. Helens. The seismic signal resembles that of January 6, 1990, and probably records a small explosion on the dome. A small mudflow detected by seismometers along the North Fork of the Toutle River was not sufficiently large to trip flood gages.

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INFORMATION STATEMENT

NOVEMBER 6, 1990  
1500 PST

Seismicity at Mount St. Helens returned to background level several hours after yesterday's small explosion (at 0207 PST on November 5) and has remained at background level since then.

A field crew in the crater yesterday found a blanket of hot dome blocks and finer-grained material overlying snow on the crater floor northwest and north of the dome; in addition, hot dome blocks up to about 2 meters in diameter were scattered on the lower part of the west crater wall northwest of the dome. These deposits represent rock debris from the explosion and from a rock avalanche on the north side of the dome. Water originating from snow melted by the hot debris blanket generated a debris flow that drained into both Loowit and Step Gulches and thence into the North Fork of the Toutle River in the early morning hours. Later in the morning, observers near Elk Rock (about 12 miles northwest of the crater) saw no definitive evidence of a flood event. The explosion and avalanche destroyed two seismic stations and a 20 foot steel tower on the crater floor north of the dome. A seismic station on the dome and one in an underground vault on the north crater floor survived the event.

The plume from yesterday's explosion was blown to the southeast. Light ashfall was reported as far away as Fossil, Oregon (125 miles southeast).

This event is one of a family of small explosions that have occurred on the dome since August 1989. These explosions occur without recognizable warning, have significant effect only within the crater, and are likely to recur.

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INFORMATION STATEMENT

SEPTEMBER 19, 1997

Heavy rainstorms at Mount St. Helens on Sept 16-17 generated a debris avalanche/debris flow from the crater of Mount St. Helens. Based on data from monitoring instruments, the flow peaked at about 1:40 AM on September 17. Field investigations on the 18th indicate that a wet debris avalanche about 50-80 feet thick passed over Loowit Falls. Most of the sediment was deposited in the next mile of Loowit drainage. The majority of the flow turned west at the base of the mountain and traveled downstream toward the North Fork Toutle River, depositing most of the remaining sediment before reaching the base of Johnston Ridge. The flow also sent a small amount of sediment and water into Spirit Lake, washing out the hiking trail across the Pumice Plain in at least two locations.

The debris avalanche/flow was unrelated to any volcanic activity in the crater. Compared to the volcanically-generated debris flows and debris avalanches of the early 1980s, this event was small. However, this was the largest storm-generated debris avalanche/flow from the crater in at least 10 years. Future rainstorms could generate similar events. USGS crews will return to the crater today to continue investigating the event.

The U.S. Geological Survey and University of Washington Geophysics Program, in cooperations with the U.S. Forest Service, continue to monitor conditions at Mount St. Helens.

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## INFORMATION STATEMENT

JUNE 2, 1998

The level of earthquake activity at Mount St. Helens has been gradually increasing over the past several months and accelerated during May. Rates of activity have gone from an average of ~60 well located events per month last winter to 165 events in May. Most of these recent earthquakes are very small with only 3 events larger than magnitude 2. The largest earthquake was on May 1 with a magnitude of 2.2. These earthquakes are occurring in two clusters directly beneath the lava dome in the crater. One cluster is in the depth range of 2 to 5 km below the dome and the other is in the depth range of 7 to 9 km. Almost no events have been located in the very shallow region of 0-2 km below the dome. None of these earthquakes are low-frequency, volcanic events that typically occur as precursors to major eruptions.

This increased earthquake activity seems to be similar to that which occurred in 1995, although the current activity is now more energetic. The 1995 activity lasted for several months in the summer and fall, had a maximum earthquake rate of 95 events per month, and resulted in no volcanic activity. A similar increase in earthquake activity in the Mount St Helens system occurred in 1989-91. However, at that time there were also a number of very shallow earthquakes accompanied by a series of sudden steam explosions. These explosions were small eruptions of steam and gas that ejected rocks and dust (ash) from cracks in the dome. Rocks were thrown up to 1 km (1/2 mile) from the dome and ash clouds reached altitudes up to 6 km (20,000 feet) and locally deposited a dusting of ash downwind in a few cases. Some explosions melted snow in the crater and generated small lahars that flowed onto the Pumice Plain.

Because increased earthquake activity within the deep St. Helens system may reflect increased pressure at depth, it is possible that the current earthquake activity may eventually lead to renewed volcanic activity. However, it is unlikely to do so without significant additional precursory activity.

We continue to monitor the situation closely and will issue additional information statements should they be warranted.

Maps and temporal plots of the Mount St. Helens activity may be found on the WORLD WIDE WEB at URL:

<http://vulcan.wr.usgs.gov/Volcanoes/MSH/CurrentActivity>  
(CVO Menu - Monthly Summaries)

and

<http://www.geophys.washington.edu/SEIS/PNSN/HELENS>  
(University of Washington - Seismic Updates)

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INFORMATION STATEMENT

JULY 1, 1998

This statement updates the Information Statement of June 2, which described an increase of earthquakes in May at Mount St. Helens. The number of well-located earthquakes has increased from an average ~60 well-located events per month last winter, to 165 events in May, to 318 in June. June's earthquakes were very small, only 11 events larger than magnitude 1, the largest M=1.8. Even though the number of earthquakes increased in June, the average magnitude was so small (a person standing in the crater would not feel most of these earthquakes) that total seismic-energy release for the month was about the same as that of May. These earthquakes continue to occur chiefly in two clusters directly beneath the lava dome in the crater. One cluster is in the depth range of 2 to 5 kilometers (1 to 3 miles) below the dome, the other in the depth range of 7 to 9 kilometers (4 to 6 miles). Almost no events locate in the very shallow region 0 to 2 km below the dome. To better portray earthquake data, plots of number of events and seismic energy release are now updated daily (see Internet sites listed below).

In response to the increased level of seismicity, USGS scientists increased monitoring in June. An airborne survey of volcanic gases revealed the presence of magmatic carbon dioxide. Under high pressure deep within Earth's crust, carbon dioxide is dissolved in magma. As magma ascends, the pressure drops and carbon dioxide forms bubbles that separate from the magma. The carbon dioxide, which is far less dense than magma, rises through fractures in the rocks beneath the volcano and escapes to the atmosphere. Winds then mix and disperse the carbon dioxide. But because it is heavier than air, carbon dioxide can concentrate in surface depressions in the dome or crater floor, especially under calm conditions, and pose an asphyxiation hazard. Poorly ventilated cavities such as caves in the mass of snow and ice that is accumulating behind the dome could also be hazardous.

A network of surveying targets was established on the lava dome, crater floor, and lower flanks of the volcano to detect any ground movements that might occur in response to changes beneath the volcano. No significant movement occurred at any of the targets on the north flank of the dome between the first measurements on June 5 and a follow-up

survey on June 29. Additional measurements of survey targets will be repeated periodically for the foreseeable future.

The increase in earthquakes and the release of carbon dioxide within the St. Helens system probably reflect replenishment of the magma reservoir, whose top is about 7 kilometers (4 miles) below the crater. This process will eventually prepare the volcano for renewed magmatic eruptions. Scientists don't know how much replenishment has occurred, or how much is necessary for renewed magmatic eruptions. However, such eruptions are unlikely without a significant increase in precursory activity. Owing to the recent unrest, the probability of small steam explosions from the dome, like those that occurred between 1989 and 1991, has increased slightly over the past month. Our concern for these will be heightened greatly if shallow seismicity increases.

We continue to monitor the situation closely and will issue additional information as warranted.

Maps and temporal plots of the Mount St. Helens activity may be found on the WORLD WIDE WEB at URL:

<http://vulcan.wr.usgs.gov/Volcanoes/MSH/CurrentActivity>  
(CVO Menu - Monthly Summaries)

and

<http://www.geophys.washington.edu/SEIS/PNSN/HELENS>  
(University of Washington - Seismic Updates)

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INFORMATION STATEMENT

AUGUST 14, 1998

The rate of earthquake activity, which accelerated markedly from May through mid July, has returned to a level similar to that of last winter. The number of well located earthquakes in July was 445, compared to 318 in June, but most of July's earthquakes occurred during the first three weeks of the month. The average rate for the past two weeks has been only about 4 well-located earthquakes per day. There have been several temporary increases in earthquake activity since the last dome-building eruption in October 1986. This recent episode was the most intense.

Airborne surveys of volcanic gases reveal that levels of magmatic carbon dioxide have decreased since June. However carbon dioxide is still present and measurable. The carbon dioxide is probably being released from magma that entered the magma reservoir during the past few months. The top of the magma chamber is about 7 kilometers (4 miles) below the crater. Because carbon dioxide is heavier than air, it can concentrate in surface depressions on the dome or crater floor, especially under calm conditions, and



pose an asphyxiation hazard. Poorly ventilated cavities, such as caves in the mass of snow and ice behind the dome, could also be hazardous.

We continue to monitor the situation closely and will issue additional Information Statements only if conditions change significantly. Daily updates of earthquake data and other information can be found on the WORLD WIDE WEB at URL:

<http://vulcan.wr.usgs.gov/Volcanoes/MSH/CurrentActivity>  
<http://vulcan.wr.usgs.gov/Volcanoes/MSH/CurrentActivity>  
(CVO Menu Monthly Summaries)

and

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(University of Washington Seismic Updates)

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