UTAH GEOLOGICAL AND MINERAL SURVEY

REPORT OF INVESTIGATION

No. 154

MOUNT ST. HELENS

A Report to

Governor Scott M. Matheson

Lorayne Tempest, Director
Utah Division of Comprehensive Emergency Management

J. Wanless Southwick, Ph.D.
Environmental Epidemiologist, Utah Department of Health

Bruce N. Kaliser, Chief Engineering Geologist
Utah Geological and Mineral Survey

June, 1980

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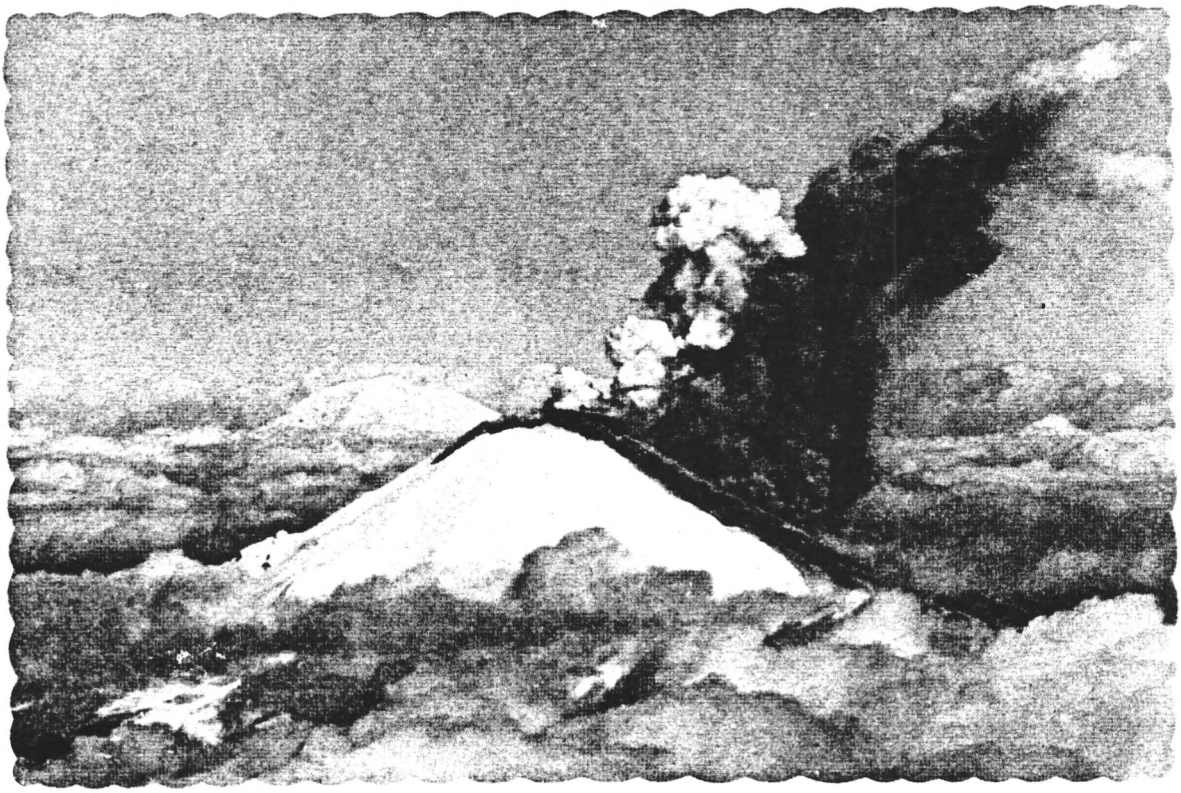

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MOUNT ST. HELENS

A Report to

Governor Scott M. Matheson

PREFACE

On March 29, 1980, a little noticed earthquake signaled Mount St. Helens' first stirrings in 123 years. Then on May 18th, Mount St. Helens erupted with a force likened to an atom bomb, killing 28 people and leaving 50 missing. The explosion unleased a series of mudflows, pyroclastic flows and caused flooding. A lateral blast ripped a fanshaped swath out of the forest which was eight miles long and 15 miles wide. Ash, several feet deep in areas close to the peak, was pushed as far as 500 miles to the east where it "turned day into night." Idaho received four to five inches and Montana had about ¼ inch of ash. Governor Ray received a Presidential Disaster Declaration and the State of Washington is currently in the recovery phase receiving federal assistance to cope with the disaster.

On June 1, 1980, Governor Scott M. Matheson sent three state employees to Washington State to gather information on the Mount St. Helens eruptions for the purpose of finding out what preparations the State of Utah can make should another eruption bring ash fallout to Utah. Lorayne Tempest, Director of the Comprehensive Emergency Management Program served as team leader and coordinator. She was accompanied by J. Wanless Southwick, Ph.D., Environmental Epidemiologist, Department of Health and Bruce Kaliser, Chief Engineering Geologist, Utah Geological and Mineral Survey. The three member delegation was chosen to represent different subject viewpoints to assure a broad perspective in their observation roles.

The following information and recommendations are the result of interviews and observations conducted by the group and are presented to the Governor of Utah for his consideration and possible action.

INTRODUCTION

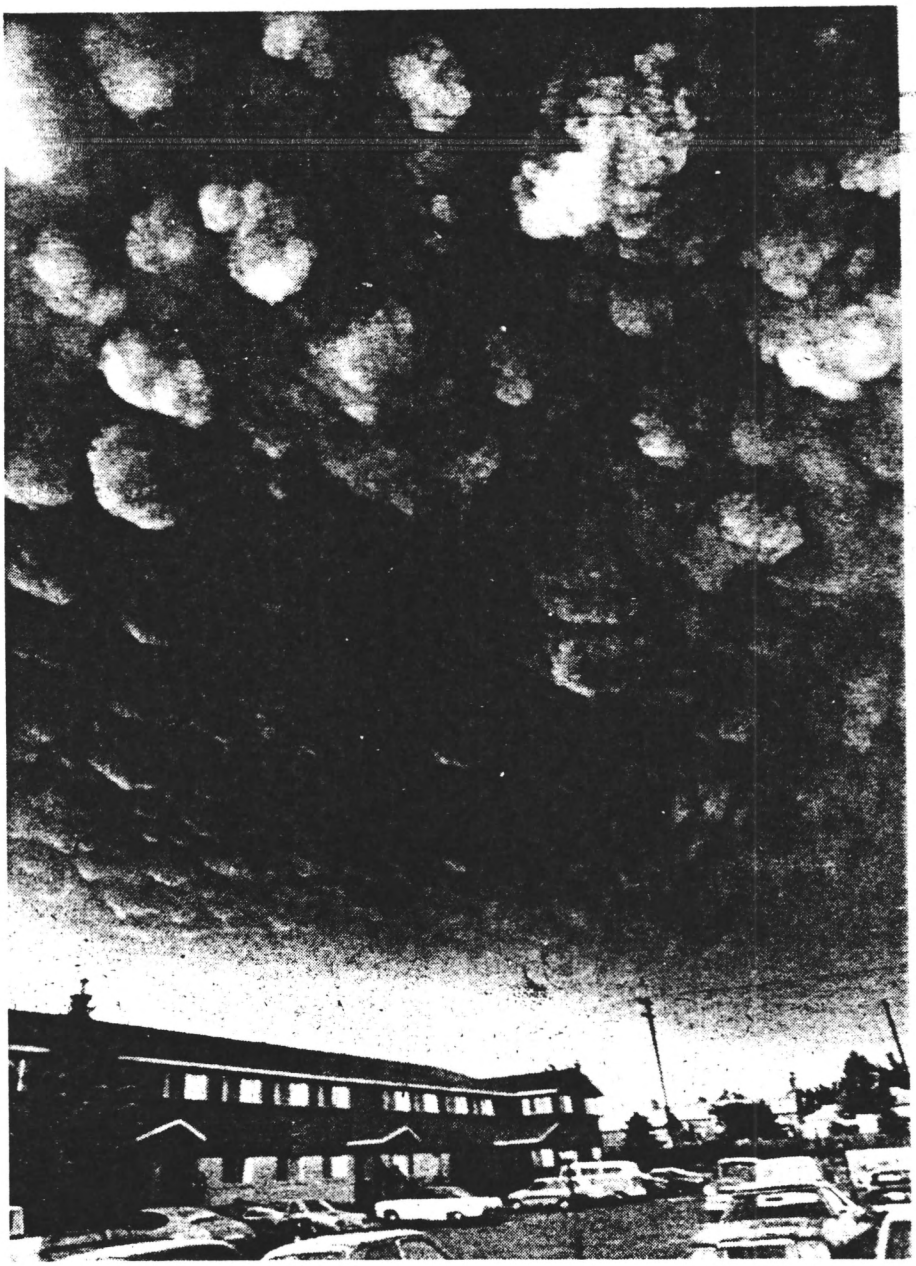
The Mount St. Helens volcano poses a potential threat to the health of Utahns. The following information is provided should a subsequent major eruption associated with unfavorable meteorological conditions bring volcanic ash to Utah. The information was obtained from observations and discussions with the Emergency Operations Center (OES) for the State of Washington in Olympia, and the Federal Disaster Center in Vancouver. Interviews were conducted with the State Director of the Washington OES, Operations Supervisor, State Geologist, State Department of Natural Resources, State Department of Ecology, medical and environmental specialists. Also, information was obtained from the Disaster Public Information Center and the Technical Information Center in Vancouver.

ASH FALLOUT

Ashfall is the one of five potential geologic hazards* associated with Mount St. Helens that has some potential of affecting Utah. None of the eruptions to date have deposited ash on Utah but there is no assurance that the next eruption, possible at any time, will not fallout over all or portions of our state. Indeed, the U. S. Weather Bureau in Salt Lake City indicated that wind circulation from the vicinity of the volcano towards Utah is not at all uncommon, particularly in the cooler parts of the year, through late June. The Federal Emergency Management Agency, Region X, established a new warn-

**Mudflow, pyroclastic flow, lateral blast and lava are the other four.*

ing system (figure 1) which will provide all participating and interested agencies and officials information concerning volcanic eruptions, mudflows, flooding, ash fallout and projected trajectory of ash fallout.



Associated Press

Boiling clouds of ash darken sky over Richland, Wash., 130 miles east of St. Helens, on May 19.

In Utah we may expect quite fine particles, of dust size. Some percentage of these particles will be capable of passing through conventional air filters. The ash will consist of essentially two main constitutents: (1) pumicious volcanic glass, and (2) crystal fragments of feldspar. Researchers do not believe that short term exposure to the ash by the general population poses a significant health hazard. It is important to recognize that only minute amounts of "free silica" particles have been found in

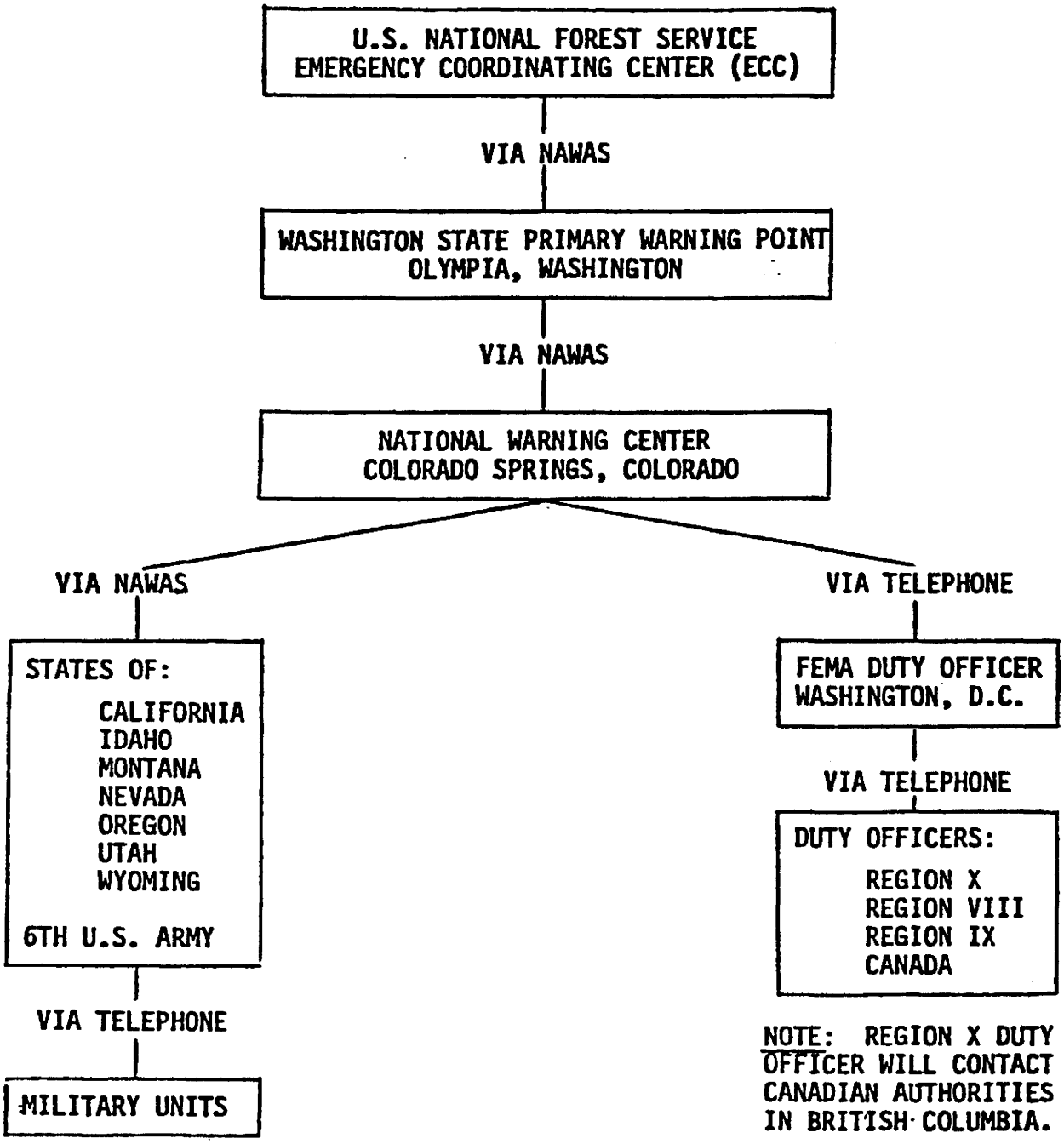


Figure 1. Schematic diagram of Mount St. Helens warning system.

the ash. Researchers don't believe silicosis poses any threat to the general population. People working in areas of heavy dust concentration, however, may be at risk.

The ash will not corrode metal, plastic or rubber. Abrasiveness is the major problem associated with the ask. The particles are relatively hard and are quite angular. Water soluble substances (acids and salts) may cling to the particles of glass and to feldspar crystals. In the eruption of May 18th there were small amounts of soluble substances. At Moscow, Idaho, some 370 miles from Mount St. Helens, the acidity was mild at ph 5.7. Fluorine measured 0.006 milligrams per gram of ash; chlorine, 0.8 mg/g and sulfate sulfur, 0.8 mg/g. Overall chemical composition is that of a dacitic volcanic rock.

Analyses to date indicate that the ash from Mount St. Helens carries only small amounts of fluoride, so that the amount leached from the ash is not significantly greater than the fluoride content of some city water supplies.

No toxicological effects have been observed to date on laboratory animals, but toxicological studies are being continued to assess long-term effects of the volcanic ash in animal feed and drinking water.

The Center for Disease Control (CDC) has established a hospital-based surveillance network which includes 21 hospitals and 2 clinics in Washington, 15 hospitals in Idaho, 7 in Montana, and 6 in Oregon. The initial CDC impression of lack of severe dust-related acute respiratory disease, based on daily contact with the hospitals was in agreement with the opinion expressed at a meeting of the statewide Washington Lung Association on May 28, 1980.

According to public health workers in Washington State, emergency rooms and clinics did not have a significant increase in allergy, asthma or other upper respiratory complaints. There was an increase, however, in the number of hysteria cases being reported.

Recommendations for Dealing with Ash Fallout

- Change filters often (air conditioning, furnace, fuel etc.)
- Do not wipe dry ash from windshields, windows, cars, etc., due to abrasive qualities. Use a detergent-soaked cloth or sponge and dab or blot rather than wipe.
- Reduce dust around pumps.
- Stove fans and vents should be thoroughly cleaned.
- Water treatment plant operators should monitor the need for greater chlorine dosage due to high turbidity caused by suspended ash.
- Power companies should be prepared for unanticipated peak loads resulting from lighting requirements due to darkening of the sky.
- Telephone companies should be prepared to experience strained circuits due to people wishing to compare notes with other people over the fall of the ash.

- Individuals involved with occupations that would expose them to greater amounts of ash, such as in cleanup operations, should take precautions. These precautions should include wetting down to reduce ash mobility and use of high efficiency dust masks.

- Individuals with chronic bronchitis, emphysema and asthma should take special precautions to avoid undue exposure. Individuals wearing contact lenses should also take appropriate precautions.

- When dust is visible in the air, fabric masks, including those improvised from handkerchiefs will filter out the larger dust particles and should be dampened with water.

- It is advisable to keep children and adults with respiratory problems indoors when ash is visible in the air.

Relevant Ash Fall Observations for Utah

- Ash fallout will be determined by direction and strength of winds at the altitudes reached by the initial ascending ash column, at the time of the eruption.

- Once settled, the ash may add to the tightness of the soil, decreasing its infiltration capability.

- Salt content from a heavy ash fall could result in some damage to cucumbers, tomatoes, potatoes, corn, lettuce and some bedding plants only when deposited in a moist condition or if a very light rainfall follows the fallout. Damage will not result if the ash fall has been dry and it has been removed from vegetation by shaking, air blasts and very thorough watering by rain or irrigation.

- Most soils are ultimately improved, both chemically and physically, by admixture of ash.

- Ingestion of ash by adults, children and animals are reported to be non-harmful.

- Harmful gases are not reported.

LESSONS LEARNED FROM THE WASHINGTON OES

The Washington State Office of Emergency Services (Edward Chow, Jr., Director) seemed to be well organized for emergency management, but because of the magnitude of this natural disaster they had insufficient manpower. The Federal Emergency Management Agency had manpower resources and experience to set up an effective Federal Disaster Center, but the state tended to construe the energetic federal efforts as a "take over." It was apparent that the state must assert itself in assuming the primary role following any disaster declarations. Governor Ray exercised her option to maintain state control.

Declaration of the location of a central emergency operations center should be forthcoming from the Governor immediately following the event so that the federal as well as state and local agencies can comply with the State Executive's wishes.

Recommendations for the Utah Division of Comprehensive Emergency Management.

Currently there is insufficient staff within the Utah Division of Comprehensive Emergency Management due to the funding cuts during the 1980 Budget Session. Therefore, it is recommended that state employees be appointed to the following emergency management positions:

a. State Coordinating Officer.

b. Governor's Authorized Representative.

c. Public Assistance Officer.

d. Individual Assistance Officer.

e. Disaster Assistance Center Manager.

f. Operations Officer.

g. Public Information Officer.

h. Communications Officer.

In addition, the following Emergency Operating Center positions are needed to be filled:

a. Telephone Operators (4)

b. Messengers (4)

c. Security (2)

d. Clerical (2)

e. Communications specialists (4)

The above individuals will be trained by the State Division of Comprehensive Emergency Management and the Federal Emergency Management Agency, Region VIII, and will only perform their duties during an emergency response mode.

News Media

Immediately after the Mount St. Helens eruption, the Washington State OES was swamped with telephone calls from the news media thus tying up the telephone for a couple of hours.

The Utah Division of Comprehensive Emergency Management currently has 4 telephone lines and all numbers have been given out to the press.

It is recommended that two unlisted numbers be installed in the office to prevent the lines being jammed by incoming calls. The two unlisted numbers will enable all emergency outgoing calls to be available.

Public Information

It is recommended that a similar approach to the Public Information Center conducted at the Federal Disaster Center in Vancouver, Washington be initiated in Utah. The following steps need to be taken:

A. Agencies of state government with the necessary scientific and technical expertise must be tapped immediately to avail its expertise to the Utah Division of Comprehensive Emergency Management.

B. A coordinating center for technical/scientific investigations must exist to avoid duplication of efforts and the entry of unnecessary personnel which could impede the emergency operations.

C. Identification cards for authorized personnel would keep the objective of item "B". Remember that teams of specialists will arrive from out-of-area and out-of-state, in perhaps considerable quantities.

D. An adequate mechanism for information dissemination must exist and must be predesigned so that the media becomes an asset rather than a liability to the recovery operations.

E. Adequate communications must exist so that dependence is not reliant upon functioning commercial telephone systems. (i. e., the Governor may require agencies that he identifies as having a critical role to acquire necessary emergency communications equipment).

F. Identify all public information officers within each state agency.

G. All state agencies should coordinate their news releases through the State Disaster Information Center.

H. The Utah Division of Comprehensive Emergency Management will prepare weekly written summaries for the Governor describing significant activities.

I. Written summary of activities will be produced for the affected constituents' legislators and congressional delegation for release each week.

Scientist's Role in Emergency Operations

Much of what was observed with respect to the relationship between scientific disciplines and the non-scientific community will be applicable in the event of a major earthquake in Utah.

The size of this disaster promoted development of a novel information flow system which has been effective. As shown in figure 2, information about the disaster was channeled to the public by public information officers representing many governmental agencies. These public information officers that manned the Disaster Information Center had effective back-up from a "Technical Information Network".

For example, four groups of geologists were employed at four centers of emergency management operations. At the Disaster Field Office, two groups of geologists were housed, one to work full

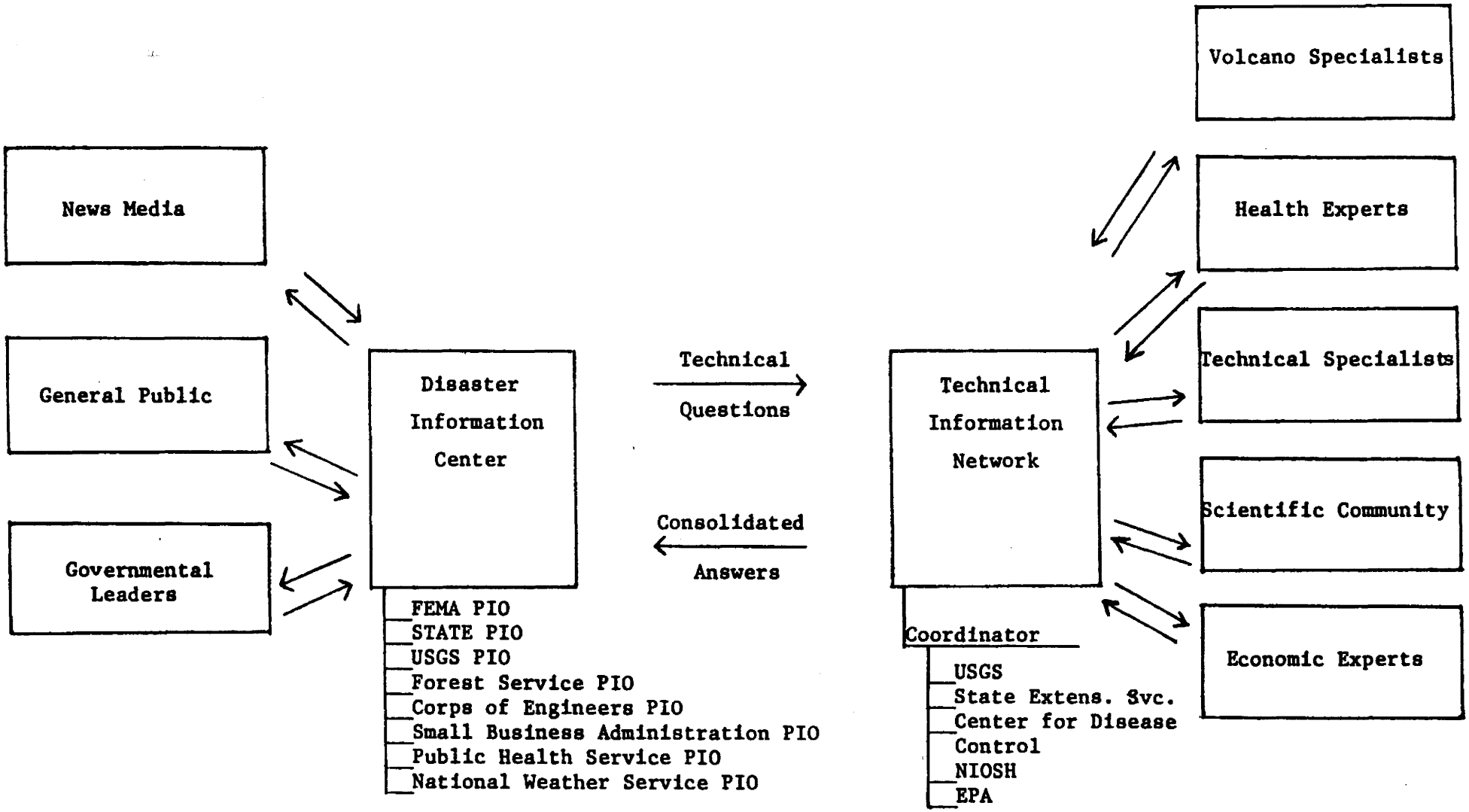


Figure 2. Information flow from Mount St. Helens Disaster Field Office.

time with the news media at the Disaster Information Center, and one to work with the Technical Information Network Office. Geologists assigned to the Disaster Information Center assembled material on the volcano, participated in once to thrice daily news conferences and answered geological inquiries.

The geologists assigned to the Technical information Network shielded the Disaster Information Center from the flood of conflicting "expert" opinions. Technical data and their interpretations were assessed by the Technical Information Network Staff, conflicting interpretations were evaluated and a consolidated report of technical information was issued as numbered bulletins.

A third group of geologists was assigned to the field to monitor volcanic activity and to determine hazards from mudflows and other volcanic phenomena including the dams that were created across drainages by flowing debris. A fourth team of geologists worked in the Federal Building in the offices of the U. S. Forest Service and monitored remote recordings from seismographs and tiltmeters on the flanks of the volcano. They tried to interpret the new scientific data that emerged from the field, from aircraft overflight observations and from the instrumentation. These geologists then conveyed their findings to other emergency operations personnel and to the Technical Information Center and the Disaster Public Information Center.

In this Mount St. Helens disaster, the government recognized this thirst for technical information and, in unprecedented fashion, made available widespread expertise, going to great length to assemble all of this expertise at a single center.

It is important to recognize that science has few answers with respect to our dynamic earth, therefore, it is imperative that the best human and physical resources must be applied to make technical assessments.

VOLCANISM IN UTAH'S FUTURE

Evidence for volcanic eruptions in our state exists for as recently as 1,000 year ago. In the vicinity of Santa Clara, in Washington County, there is a linear basaltic flow with a north-south trend that extends for over nine miles north of old U. S. 91 and almost one mile south of that highway. Direction of flow was from north to south from two vents in the vicinity of Diamond Valley, just east of Utah Highway 18.

In the Black Rock Desert, in Millard County, volcanics believed to be as recent as 1,000 to 4,000 years old occur west of Fillmore in what is called the Ice Springs Field. Immediately to the south lies the Tabernacle Field, believed to be 11,000 to 12,000 years old.

To date, no one has dared speculate on the likelihood of occurrence of a volcanic event in Utah. It must be said, however, that the possibility may not be altogether ruled out. It is important to note that the volcanism in Utah is of another type entirely, with lava flows being the predominant mode rather than explosive pyroclastic outbursts as in the case of Mount St. Helens. Certainly any potential hazard from volcanic eruptions in Utah is, because of time likelihood and type of phenomenon, orders of magnitude less than is posed by Mount St. Helens.

SUMMARY

The role of the federal government, by admission, is to support and supplement, complementing if necessary, the state's efforts. The state, therefore, must be thoroughly prepared to assume its responsibilities to direct emergency operations, availing itself of whatever additional resources it requests from the federal government.

State personnel must work alongside whatever federal field personnel are employed to assure that state and local agencies are advised of the technical data acquired.

All of the above recommendations could be implemented in part or in total based on the severity of the problem.

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APPENDIX A

Scott M. Matheson
Governor

STATE OF UTAH
DEPARTMENT OF HEALTH
150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

June 13, 1980

TO: Physicians, Hospital and Nursing Home Administrators

On June 1, 1980, Governor Scott M. Matheson sent three state employees to Washington State to gather information on the Mount St. Helens eruptions and what preparations the State of Utah can take should another eruption bring ash fallout to Utah. Lorayne Tempest, Director of the Comprehensive Emergency Management program served as team leader and coordinator. She was accompanied by J. Wanless Southwick, Ph.D., Department of Health and Bruce N. Kaliser, chief engineering geologist.

The Mount St. Helens volcano poses a potential threat to the health of Utahns. The following information is provided should a subsequent major eruption associated with unfavorable meteorological conditions bring volcanic ash to Utah. This information is summarized from reports issued by the Mount St. Helens Technical Information Network, a program of the Federal Emergency Management Agency. Additional information from the Center for Disease Control (CDC), Atlanta, Georgia, is also included.

ASH ANALYSES

The abrasiveness of substances identified in the ash are similar to, or slightly greater than, that of finely crushed window glass. The major components of the ash appear to be silicon-containing materials, aluminum and other oxides.

Preliminary analyses of volcanic ash samples have shown a consistent, but low concentration of free crystalline silica (SiO_2). The proportion of free silica, a prime causative factor in silicosis, has been about 6 percent of the total respirable size ash particles (under 10 microns) by weight. Of the free silica, about 4 percent is in the form of cristobalite and about 2 percent exists as free quartz.

Dr. Robert Bernstein, a physician with the National Institute of Occupational Safety and Health (NIOSH) team in Washington State has issued the following statement on silicosis: "At this time, we don't believe silicosis poses any threat to the general population. People working in areas of heavy dust concentration, however, may be at risk and should be wearing NIOSH approved face masks. These masks are 98-99 percent effective in screening out harmful particles of free silica."

Potentially harmful substances in some volcanic ash are water soluble acids and salts. Concentrations of these materials in the Mount St. Helens ash apparently were not large enough to significantly affect well- or surface-water supplies in the affected areas.

The U.S. Geological Survey (USGS) conducted partial analyses of these soluble substances which were leached from samples collected at Moscow, Idaho (about 370 miles from the volcano). The results showed the following:

Acidity-mild, (ph-5.7)
Chlorine-0.8 milligram per gram of ash.
Fluorine-0.006 milligram per gram of ash.
Sulfate Sulfur-0.8 milligram per gram of ash.

Amounts of these substances may be expected to vary somewhat from sample to sample.

HOSPITAL ADMISSIONS & EMERGENCY ROOM VISITS FOLLOWING MAJOR ERUPTIONS

In the Moses Lake area, where the volcanic ash fallout was the heaviest, a 5.5 percent increase in admissions was reported for the week following the first eruption on May 18, 1980. Hospitals in Idaho and other parts of Washington, however, reported admissions to be lower by 21.3 and 17.0 percent respectively. This drop in admissions might have been due to postponement of elective hospitalizations.

Emergency room visits in the Moses Lake area increased steadily after the first eruption. There was a 34.2 percent increase over the previous week. There was also an abrupt increase noted in ER visits on May 24, 1980. This coincides with the beginning of clean-up efforts in the area.

In comparing ER visits in the Moses Lake area for the two weeks before the first eruption and the two weeks thereafter, the sharp increase in visits were associated with the following: automobile accidents, falls, respiratory complaints (such as upper respiratory infections, pneumonia, influenza, asthma and bronchitis) and ear problems. Overall there was a 23 percent increase in ER visits for the four week period.

Hospitals in Washington and Montana reported ER visit increases of 2.7 and 8.0 percent respectively. Idaho, however, reported ER visits decreased 9.1 percent the week after the first eruption but appeared to be increasing after the second eruption on May 25.

RECOMMENDED ACTIONS TO MITIGATE HEALTH EFFECTS OF ASH EXPOSURE

Precautions for handling the ash include the following:

(1) handle dust out-of-doors or in well-ventilated areas;

(2) whenever possible the ash should be wetted down to reduce its movement;

(3) high efficiency dust masks should be worn by those who will be heavily exposed. (See attached list.)

The general public should avoid unnecessary exposure. A light facemask (e.g. surgical mask) worn out-of-doors may be helpful in reducing the inhalation of large particles of dust.

Individuals with chronic bronchitis, emphysema and asthma should take special precautions to avoid undue exposure, such as staying indoors, and using face masks or high efficiency dust masks as needed.

Individuals wearing contact lenses would be advised to not wear them and use glasses during periods of high exposure.

SPECIAL CONSIDERATIONS FOR CHILDREN

Children face the same hazards from the suspension in air of volcanic ash as other age groups. It does not appear that asthmatic children in the paths of the ashfall plumes have had any significant increase in symptoms compared to children with similar problems in unaffected areas.

The ash may cause irritation of the lungs or exacerbation of symptoms in children suffering respiratory illness (asthma, cystic fibrosis, tuberculosis).

The following steps should be taken to protect children from undue exposure and potential health risks:

- Keep children indoors when ash is visible in the air.

- Advise against strenuous play as exertion leads to heavier breathing.

- Parents should arrange for quiet, indoor games when ash is visible in the air.

- If children must be outdoors when ash is present in the air, they should wear a mask, preferably one marked with "TC-21C", approved by NIOSH. Commercially available masks are generally designed to fit adults. However, one mask, Number 8710 of the 3M Corporation, is stated by the manufacturer to be adaptable to children as young as 5 years.

- Fabric masks, including those improvised from handkerchiefs, will filter out larger dust particles. These should be dampened with water when the dust is visible in the air and if no approved mask is available.

- Children old enough to know the difference should be encouraged to breathe through the nose.

- Evidence to date suggests that ingestion of ash is not a hazard to the health of children or adults.

- Children should be prevented from playing in areas where ash is deep on the ground or piled up.

- Frequent cleaning of home interiors will minimize the amounts of indoor ash exposure for children.

Other information will be disseminated as appropriate based on additional findings, future volcanic activity and weather patterns.

Sincerely,

James O. Mason

James O. Mason, M.D., Dr. P.H.
Executive Director

Attachment

cc: Utah State Medical Association
Utah State Hospital Association
Utah State Health Care Association

Masks which provide protection against lung damage from small mineral particles are approved by the National Institute of Occupational Safety and Health (NIOSH). Masks with printing on the manufacturer's container indicating NIOSH approval for protection against "pneumoconiosis" and "fibrogenic dusts" are the masks which will filter out these small particles. The mask will also carry a coded marking starting with "TC-21C" and followed by another two or three digit number.

We have been able to identify the following brands which have the appropriate NIOSH approval:

Single Use Approved Face Mask, (up to $3.00 each. Throw away when they become difficult to breathe through, or structure of the mask is destroyed).

Manufacturers	Number
3M	6983
3M	8710
3M	9900
3M	9910
3M	9920
American Optical (AO)	R1050
Binks	40-150
Norton	7170
Willson	1400
Willson	1410

NIOSH Approved Masks for Multiple use, ($8.00 and up for holder and .25¢ to $1.00 each for replaceable filter elements - elements need be replaced only when they become difficult to breathe through).

Manufacturers	Number
American Optical (AO)	R2090N
American Optical (AO)	R4030
American Optical (AO)	R5030
American Optical (AO)	R6030
MSA Dust FO	66
MSA Dust FO	77
MSA Dust FO	88
MSA Comfo II	459440
Willson	560
Willson	1210
Willson	1211
Willson	1212

APPENDIX B

FEDERAL COORDINATING OFFICE
federal emergency management agency

MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Friday, May 30, 1980

BULLETIN #2b- "Driving and Vehicle Maintenance in Heavy Ash Areas"

The following advice is provided by the U.S.Army Tank-Automotive Research and Development Command from Warren.Michigan and the Washington State Patrol. This advice is based on experience and field tests now being conducted with State Patrol cars in heavy ash/dust areas. The U.S. Department of Transportation concurs with this advice.

(1) Avoid driving in heavy dust conditions unless absolutely required. The more dense the dust, the more urgent the requirement should be for driving.

(2) When required to drive in dense dust, keep speed down to 35 mph or lower. Do not follow too close to car ahead. Use headlights on low beam.

(3) Change oil often. In very dense dust change at 50-100 mile intervals. Light dust conditions change oil at 500-1000 mile intervals. Lubricate all chassis components at each oil change.

(4) Clean air filter by backflushing filter paper with compressed air (30 psi). Caution: Blow element from inside (clean side) to outside (dirty side). DO NOT strike filter against anything. Air clean only. If unsure, have a qualified mechanic perform the air filter service.

Inspect filter for dents or torn paper. Clean the inside of the filter and the filter cover with damp cloth before reinstalling filter.

Reinstall filter in housing and tighten on cover very tight, approximately one full turn with pliers after hand tightening. Do not exceed one full turn with pliers or you may damage the system.

(5) DO NOT install hose from carburetor air intake (air cleaner) to

-MORE-

inside of car. Outside dust and ash will be drawn into vehicle.

(6) Wrapping air cleaner element with a silk stocking or cheese cloth is of questionable value. It will not improve air cleaner filtration and may actually cause serious leaks if not installed correctly. Rags, or any other intended filtering material, should not be placed over the carburetor inlet inside the air cleaner element, serious damage to the engine and/or loss of vehicle control may result.

(7) Cover passenger compartment vent inlet (located at base of windshield and usually under hood) with thick, loosely woven felt-type material to filter air into vehicle. With vent filter in place, keep heater blower on high. Blower will slightly pressurize inside of vehicle and keep dust from entering through body gaps or holes. If a vent filter is not installed, keep air conditioner and heater blowers off.

(8) Have service garage clean wheel brake assemblies every 50-100 miles for very severe road conditions, or every 200-500 miles for heavy dust conditions.

(9) Have service garage clean alternator winding with compressed air after heavy accumulation or every 500 to 1000 miles or sever dust exposure.

(10) Wash engine compartment with garden hose or steam cleaner. Be sure to seal off air intakes and electrical components before cleaning.

(11) Commercial truck filters can be installed to increase the filtering capacity of the air cleaner, as the Washington State Patrol has done. However, this is expensive and should only be attempted by trained garage mechanics or experienced personnel. This would be beneficial for vehicles operating continuously in extreme dust conditions.

(12) Air filter restriction gauges can be installed by qualified machanics. The gauge will tell you when your air filter requires servicing in order to avoid overservicing.

FEDERAL COORDINATING OFFICE

federal emergency management agency

MOUNT ST. HELENS TECHNICAL INFORMATION NETWORK

Tuesday, May 27, 1980

BULLETIN #3 - "Precautions in Handling Volcanic Ash"

The Health Services Division of the Washington State Department of Social and Health Services, in consultation with the Center for Disease Control (CDC), Atlanta, and the National Institute for Occupational Safety and Health, Morgantown (NIOSH,CDC) have been working with the laboratory at the University of Washington, and with other experts, in the preliminary analysis of ash from the Mount St. Helens eruptions. In addition, we have reviewed reports of analyses being undertaken at other laboratories, including the U.S. Geological Survey.

It is known that the ash contains silicon, but only certain types of this material are known to cause silicosis. Silicosis is an industrial disease resulting from scarring of the lungs, usually after many years of heavy occupational exposure to certain silicon dusts.

In our opinion, a sufficiently detailed analysis of the ash is not yet available to make a complete evaluation of the risks of exposure. However, from the knowledge gained so far, the short term exposures currently being received by the general population are unlikely to pose a significant health hazard. Nevertheless, certain precautions should be adopted by those people receiving heavy exposures, such as workers engaged in clean-up operations or other occupations in which exposure may occur.

These precautions include handling the dust out-of-doors or in well-ventilated areas; and whenever possible, the ash should be wetted down to reduce its movement. High efficiency dust masks should also be worn by those who will be heavily exposed. (See appendix).

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People in the general public should avoid unnecessary exposure and a light face mask (e.g. surgical mask) worn out-of-doors may be helpful in reducing the inhalation of large particles of dust which may give rise to irritation of the throat and mucus membranes.

Patients with chronic bronchitis, emphysema, and asthma should take special precaution to avoid undue exposure.

A team of physicians and industrial hygienists from CDC and NIOSH have been requested by the state to undertake studies of the immediate and long term health effects of dust exposure. Surveillance of certain hospitals in affected areas has been in progress since last week and reports of ill health have been studied. There is no indication so far that current or past exposure have given rise to any serious disease, though complaints of irritation from the dust have been received, particularly among smokers and persons with respiratory diseases. The health of the affected communities will continue to be monitored. Certain occupational groups receiving heavy exposure will be studied to evaluate the effectiveness of preventive measures.

Further statements will be made as soon as further analysis of the ash becomes available.

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BULLETIN #3 APPENDIX

Masks which provide protection against lung damage from small mineral particles are approved by the National Institute of Occupational Safety and Health (NIOSH). Masks with printing on the manufacturer's container indicating NIOSH approval for protection against "pneumoconiosis" and "fibrogenic dusts" are the masks which will filter out these small particles. The mask will also carry a coded marking starting with "TC-21C" and followed by another two or three digit number.

We have been able to identify the following brands which have the appropriate NIOSH approval:

Single Use Approved Face Mask, (up to $3.00 each. Throw away when they become difficult to breathe through, or structure of the mask is destroyed).

Manufacturers	Number
3M	6983
3M	8710
3M	9900
3M	9910
3M	9920
American Optical (AO)	R1050
Binks	40-150
Norton	7170
Willson	1400
Willson	1410

NIOSH Approved Masks for Multiple use, ($8.00 and up for holder and .25 to $1.00 each for replaceable filter elements - elements need be replaced only when they become difficult to breathe through).

Manufacturers	Number
American Optical (AO)	R2090N
American Optical (AO)	R4030
American Optical (AO)	R5030
American Optical (AO)	R6030
MSA Dust FO	66
MSA Dust FO	77
MSA Dust FO	88
MSA Comfo II	459440
Willson	560
Willson	1210
Willson	1211
Willson	1212

FEDERAL COORDINATING OFFICE
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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Thursday, May 29,1980

BULLETIN #4 -"Current Volcanic Hazards at Mount St.Helens,Washington"

The following description of the continuing and potential hazards associated with the eruption of Mt.St.Helens was prepared by Dwight R. Crandell, of the U.S.Geological Survey.

The text accompanying the map describes five types of hazards - ashfall, mudflow, pyroclastic flow, lateral blast and lava.

ASHFALL HAZARD

The volcano began erupting ash in large quantity early 5/25 after only minor activity since 5/19. Thus, Mt. St. Helens is still in an explosive eruptive phase and we should expect similar eruptions in the future. Eventually we expect either a coarser grained pumice and ash to be erupted or the magma to form a dome within the present crater. The formation of a dome in the crater also could be accompanied by the eruption of ash, but probably on a smaller scale than the eruptions of 5/18 and 5/25. At present (5/25) we don't know whether this change will take days or weeks.

In the event of a maximum expectable pumice-ash eruption, we anticipate that the distance-thickness relations would be as shown on the volcanic-hazards map. These amounts could fall in any direction from the volcano, but are more likely to fall

- MORE -

in southeasterly-easterly-northeasterly directions than to the opposite points of the compass. The actual ash-fallout sector will be determined by directions and strengths of winds at altitudes reached by the ash column at the time of the eruption.

MUD FLOW HAZARD

The debris flow that now forms the floor of the Upper North Toutle Valley appears to be stable, in the opinion of soil-mechanics experts who have examined it. The possibility of piping, or of sudden liquefaction during a strong earthquake appears to be negligible in view of the slope of the deposit and its poorly sorted texture. Mudflows may occur as streams cut down through the debris-flow deposit, but these probably will be of small volume in the immediate future, and will not reach the heights or distances of the 5/18 - 5/19 mudflows. The principal danger zone of such mudflows will be in the North Toutle River Valley.

Mudflows can also be caused by pyroclastic flows which occur during heavy rainfall, or which move down snow-covered flanks of the volcano. Mudflows caused in this way could occur in any valley which heads at the volcano, but are most likely in the North and South Toutle, Pine Creek and Muddy River Valleys because these valleys are the most probable routes of pyroclastic flows.

Mudflow hazard zones are not shown in the portions of valleys within the pyroclastic-flow hazard zones, but mudflow-hazard zones

should be regarded as extending up to the flanks of the volcano.

In the longer term, increased discharge into Spirit Lake by streams in its drainage basin could occur during periods of very heavy precipitation and/or rapid snow melt. It is possible that water would enter the lake faster than seepage through the debris flow could carry it away. In this situation, it is possible that the lake would rise to the top of the valley fill west of the lake and spill over. If this occurred, mudflows could form in the North Toutle Valley, but it is not possible now to predict their size.

PYROCLASTIC-FLOW HAZARD

Pyroclastic flows can be formed during the eruption of pumice and ash or during the eruption of a dome. The largest and longest pyroclastic flows could be expected during the eruption of coarse pumice, and would occur at the same time that a large eruption column was rising above the volcano. The maximum probable extent of pyroclastic flows is shown on the hazards map. Pyroclastic flows of this kind are most probable in the North and South Toutle Valleys and in the Muddy-Pine Creek Valleys because of the present configuration of the crater rim. They are less likely, although possible, in areas southwest and south of the volcano.

Pyroclastic flows probably would also occur during the eruption of a dome. These could be formed as the steep and unstable flanks of the dome crumble and avalanche, or are disrupted by

earthquakes and volcanic explosions. Pyroclastic flows of this type probably will not extend more than 10 miles from the dome in the North Toutle Valley, and would not occur in the other valleys because of the present shape of the crater rim.

LATERAL BLAST HAZARD

The present situation at the volcano suggests that another lateral blast of the force of the blast on 5/18 is not likely. It is possible, however, that the eruption of a dome within the crater would be accompanied by lateral blasts which could carry rock debris outward at very high velocity. The present shape of the crater suggests that lateral blasts from a growing dome would initially be directed northward. Blasts in other directions would be deflected upward by the crater walls. If a dome grew to a height above the crater rim, lateral blasts could also affect the west, south or east sides of the volcano.

The wedge-shaped blast-hazard zone extending northward from the crater is based on the low rim of the crater in that direction, and on the distance to which rock debris was transported by a lateral blast at Sugar Bowl Dome about 1,200 years ago. This distance was about 6 miles; a safety factor of 100 percent was added, so the limit of the zone all around the volcano is shown at a distance of 12 miles.

It is possible that magma could move into the volcano at

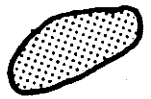
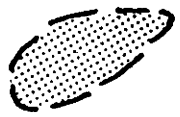
some point east, south or west of the existing crater. This probably could be detected by surveying those flanks of the volcano, and perhaps also by visual observation, as was the case of the north flank bulge of 3/27-5/18. Surveying has been resumed. No such bulge or other sign of instability on the other flanks of the volcano has been detected.

LAVA-FLOW HAZARD

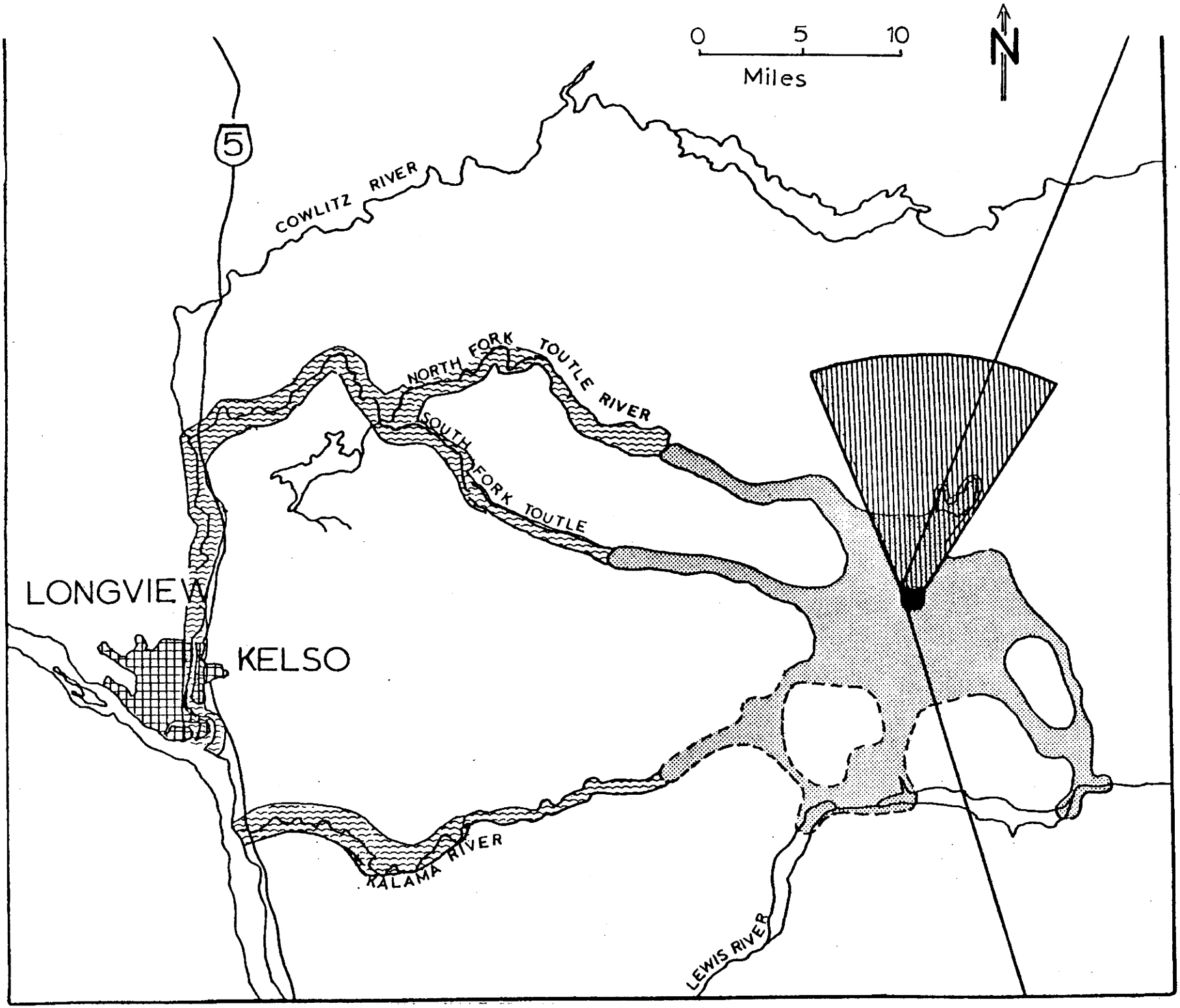
Explosive eruptions of dacite, like those of 5/18 and 5/25, typically are not accompanied by lava flows. If molten rock is erupted, it probably will be relatively viscous, and will tend to pile up around the vent and form a dome rather than a lava flow.

The past history of the volcano suggests that as this eruption progresses, the magma being erupted may be more fluid, and may form lava flows, but these are not anticipated in the next few weeks or months.

H A Z A R D M A P

PYROCLASTIC FLOWS	 High Risk  Moderate Risk
MUDFLOWS AND FLOODS	
LATERAL BLAST	
Sector toward which winds blow most frequently	

PREPARED BY U.S. GEOLOGICAL SURVEY



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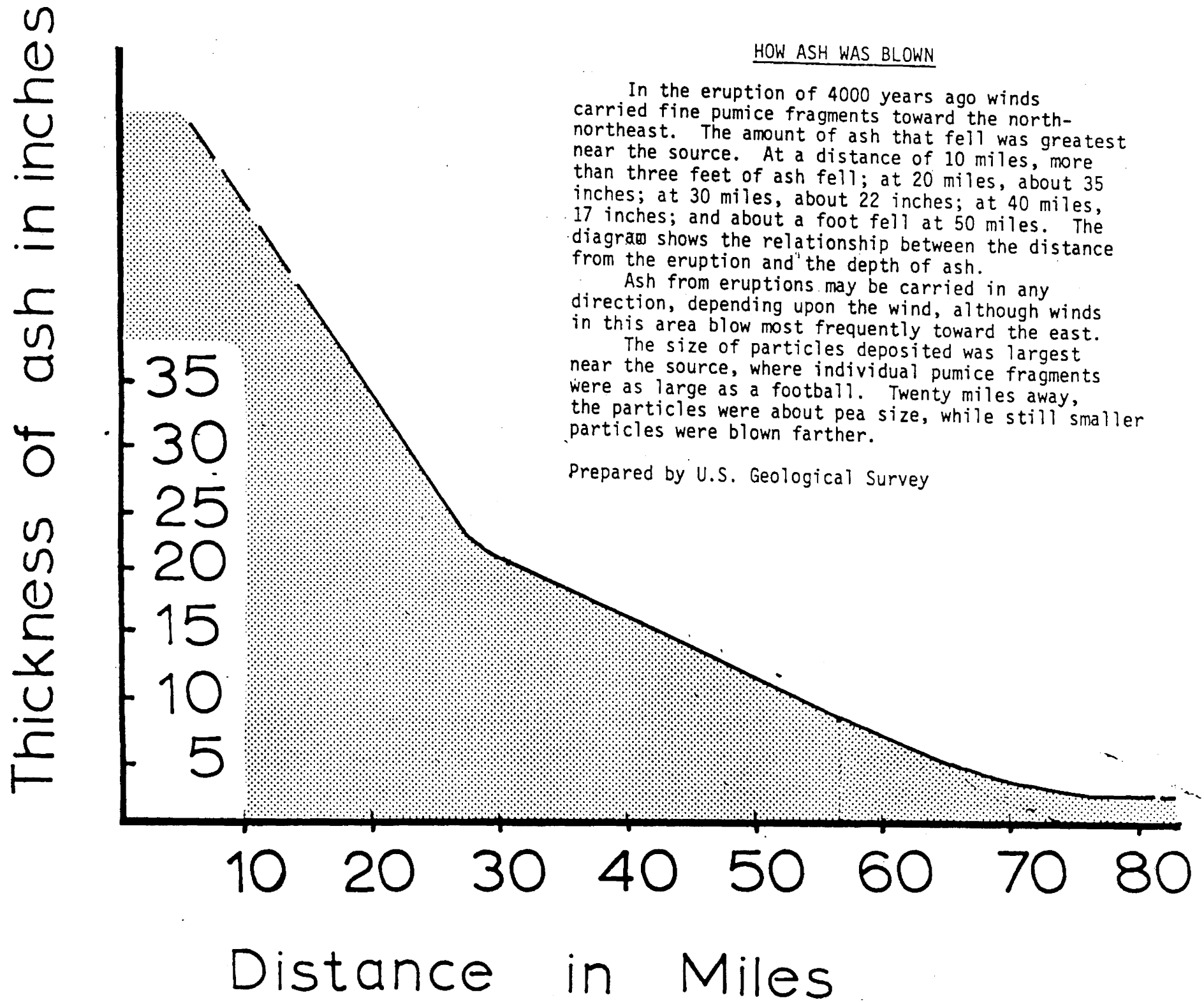

HOW ASH WAS BLOWN

In the eruption of 4000 years ago winds carried fine pumice fragments toward the north-northeast. The amount of ash that fell was greatest near the source. At a distance of 10 miles, more than three feet of ash fell; at 20 miles, about 35 inches; at 30 miles, about 22 inches; at 40 miles, 17 inches; and about a foot fell at 50 miles. The diagram shows the relationship between the distance from the eruption and the depth of ash.

Ash from eruptions may be carried in any direction, depending upon the wind, although winds in this area blow most frequently toward the east.

The size of particles deposited was largest near the source, where individual pumice fragments were as large as a football. Twenty miles away, the particles were about pea size, while still smaller particles were blown farther.

Prepared by U.S. Geological Survey

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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Friday, May 30,1980

BULLETIN #5 - "Volcanic Ash Could Reduce Insect Populations...Temporarily"

Volcanic ash fallout from Mt.St.Helens could have at least one positive side effect.

It possibly could lead to reduced insect populations, at least temporarily, according to entomologists at Washington State University. Unfortunately, beneficial insects as well as pests are being affected by the ash.

The ash apparently acts like a gigantic application of a physical insecticide, says Dr. Edward Klostermeyer, acting chairman of the WSU entomology department.

The ash apparently scars the cuticle, the insect's waxy body covering. Once this covering is scarred, the insect can't control its internal water balance. It apparently dries up and dies.

Applications of diatomaceous earth are used in the same way to control household pests, such as cockroaches. Pests, unfortunately, are not the only insects affected by the ashfall.

Klostermeyer lost an entire colony of orchard mason bees that he was trying to develop as pollinators for orchards. "They went out Monday morning to forage and did not come back."

Checks of honeybee colonies at the university have revealed "fair" numbers of dead bees outside, but fewer than are killed sometimes by applications of pesticides.

Fortunately, orchards in central Washington had been pollinated before Mt.St.Helens blew its top. According to Dr.Carl A. Johansen, WSU's authority on bees, hives had just been pulled out of the orchards.

"But," he adds, "even if you kill the entire field force, it only sets them back a few weeks. They can recover."

He foresees no effect on production of honey. Major nectar flows

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that eventually make their way to the kitchen table in the form of honey do not begin until the end of May in eastern Washington. The product itself should not be affected in any way, he added.

Johansen believes the ash may take out wild bees for a couple of years. Bumblebees, which began emerging in early March and are now trying to establish nests, have been hard hit. It is likely that yellowjacket numbers will be down as well.

Some flies have been hurt by the ash, according to Dr. Roger Akre, professor of entomology. Others have not been. And mosquitoes and aphids have not been affected at all.

"Some of the little weevils--the pea leaf weevil and the alfalfa weevil--they are so tiny they are sinking in the ash. There are literally hundreds of them out in the field lying on their backs just kicking in this stuff."

The smaller ants, he said, are able to forage on top of the ash. Larger ants, like the western thatch ant, actually sink into the ash.

"It gives them a tremendous mechanical problem. It confuses their sensory apparatus--their antennae, their eyes--and most are staying on top of their nests. They won't move.

"The minute this ash is wet down, then they'll forage. Unless we get a rain within a week or so, they will be hurt pretty badly."

Worms and slugs have also suffered substantial casualties as a result of the ash, Akre said.

In sum total, it has been the larger and more active insects that have been hurt most, said Gary Thomasson, extension pesticide education specialist. Smaller, less active insects have been able to cope.

He noted that farmers may get some relief from grasshoppers if the ash remains dry long enough.

Another major pest that may be affected by the ash is the codling moth, considered the most significant pest of apples in Washington. It also attacks pears and some stone fruits.

"The adults should be emerging this weekend. I hope some of this ash will give them problems."

He warns, however, if it rains, orchardists may have to consider spraying this weekend.

In general, the entomologists said, it would not be advisable to apply any insecticides before the ash settles.

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MOUNT ST. HELENS TECHNICAL INFORMATION NETWORK

Sunday, June 1, 1980

BULLETIN #6 - "Advice for Farmers from Washington State University--Tractors and Water Pumps"

I. TRACTORS NEED SPECIAL CARE NOW

Most farm tractors have a three-part air filtering system designed for operating under heavy dust conditions, according to Gary Hyde, Washington State University agricultural engineer. Do not replace filters until the air filter indicator comes on or there is a noticeable loss of power.

Paper filters are more effective than oil bath filters, according to Hyde. Paper filters remove 99.9 percent of the harmful particles, while oil bath filters remove 98 to 99 percent, Hyde says. This means that oil bath filters allow 10 to 20 times more dirt to enter an engine.

According to both filter and tractor manufacturers, filters remove particles that are 20 microns and larger. Tractors are designed with an oil film of 25 microns between moving engine parts. This means that the small particles which enter the engine will not rub on metal surfaces, Hyde says.

Hyde recommends servicing tractors according to manufacturers specifications. However, make sure the air filtering system is properly installed and everything is tight. Air leaks can allow large particles to enter the engine and cause damage.

You might want to increase the height of the air intake source, Hyde says. However, be sure the extension is tight and not so high it will hit wires or other obstructions.

Hyde recommends lubricating ball joints and suspension more frequently than normal. Use enough grease to force the grit out of joints. When performing maintenance that requires removing engine

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parts or covers, work in a dust-free area.

The ash will not corrode metal, plastic, or rubber, but it is very abrasive. This means that belts and chains will wear out more rapidly than normal.

II. VOLCANIC ASH SUSPECT IN PUMP PROBLEMS

Several recommendations for dealing with problems that volcanic ash is causing in irrigation sprinklers were issued Friday by Washington State University agricultural scientists.

Jim Griffin, Yakima County extension agent, and Dr. Larry James, a WSU agricultural engineer, advised that measures should be taken--where possible-- to reduce the amount of ash in irrigation water before it is pumped.

Griffin said some farmers are reporting rapid wear on pump seals, packing glands and occasionally on bearings.

He advised farmers to use settling basins whenever possible to reduce the amount of grit flowing through pumps. Wear also can be minimized by insuring that packing glands are not too tight. A slow drip of water is desirable to wash some of the dust particles through the packing.

Dust reduction measures were recommended around pumps to prevent overheating because of dust buildup in the pump ventilation system. Griffin said wetting the dust around pumps, cultivating to bury dust, or working straw into the nearby ground should help.

Griffin also said worn sprinkler nozzles can contribute to overheating because they force pumps to work harder. Nozzle wear should be checked with the end of a new drill bit and severely worn nozzles should be replaced.

There also have been reports of grit freezing sprinkler heads. Griffin said farmers should check sprinklers frequently to ensure that they are operating properly. Frozen heads usually can be freed by manually forcing the head to turn.

Sediment is reported to build up in main lines and laterals. Griffin recommends flushing them at least once a day to prevent buildup.

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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Friday, May 30, 1980

BULLETIN #7 - "Ash Particles and Home Clean-Up Problems --- Advice From the University of Idaho"

Furniture, fabrics and floor coverings may be damaged by volcanic ash particles that are sharp-edged, according to Sonja Rue and Shirley Nilsson, University of Idaho Cooperative Extension Service family living specialists.

The ash from the Mt. St. Helens volcano is different from ordinary house dust. Its sharp crystalline structure causes it to scratch surfaces when it is brushed for removal.

To clean household surfaces, the extension specialists said as much dust as possible should be removed with a vacuum cleaner. Then:

--After vacuuming carpets and upholstery, you may want to use a detergent shampoo cleaner. Avoid excess rubbing action because the sharp ash particles may cut the textile fibers.

--Glass, porcelain enamel and acrylic surfaces may be scratched if wiped too vigorously. Use a detergent-soaked cloth or sponge and dab or blot rather than wipe.

--High-shine wood finishes will be dulled by the fine grit. Vacuum surfaces and then blot with a cloth treated to pick up dust. A tack cloth used by furniture refinishers should work well.

Ash-coated fabrics should be rinsed under running water and then washed carefully. Remember:

--Soiled clothing will require extra detergent. Wash small loads of clothing, using plenty of water so the clothes will have room to move freely in the water.

--Do not mix heavily soiled clothes with garments that are lightly soiled.

--Be sure clothes are free of ash before putting them in an automatic dryer. Ash may scratch the inner surface of the dryer.

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--During the next few months, filters must be replaced often. Air conditioner and furnace filters need careful attention.

--Clean refrigerator air intakes. Clean any surface that may blow air and recirculate the dust. Stove fans and vents should be cleaned thoroughly.

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MOUNT ST. HELENS TECHNICAL INFORMATION NETWORK

Monday, June 2, 1980

BULLETIN #8 - "Physical and Chemical Characteristics of the Mt. St. Helens Deposits of May 18, 1980."

The major amount of ash from the May 18 eruption fell in a belt that extended east-northeast from Mt.St.Helens across the Ellensburg-Yakima area, then to the Ritzville-Sprague area, and then decreasingly into Idaho and western Montana. One might expect the thickness of such a deposit to decrease steadily with distance downwind. Predictably, the thickness of the deposit from this eruption decreased to about three-fourths inch in the Yakima Valley (about 80 miles from Mt.St.Helens), but then increased to a maximum of about three inches in the vicinity of Ritzville, some 100 miles further downwind, before again decreasing in the usual manner.

The rains of May 25-26 packed the initial loose deposit of the Ritzville area into a tight layer, leaving it only about one-third of its original thickness. If it remains as is, this tight layer can be expected to cause runoff and erosion in future rains. Likewise, rain and irrigation water will have difficulty seeping through to the old soil below. Such effects are typical of this type of volcanic material.

The particle-size of the ash that fell near Yakima ranges from smaller than 0.001 millimeter (about 0.00004 inch) to about 0.3 millimeters. Ash near Ritzville was correspondingly finer-grained, with a markedly larger proportion of impalpable (so fine that it can't be felt) dust-size particles and a maximum particle size near 0.05 milli-

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meters. Such material, when dry, is blown into dust clouds by only moderate winds, and much of this material can pass through conventional air filters.

Under the microscope, the two main constituents of the ash in this region are seen to be pumiceous volcanic glass and crystal fragments of feldspar (a sodium-calcium-aluminum silicate mineral). Along with these major constituents are variable but generally small amounts of amphibole, pyroxene, magnetite, and particles of 'old' volcanic rock, torn off the walls of the eruptive vent. It is probable that the proportion of glass in the very fine ash material is greater than it is in the sizes that are readily identifiable by the microscope.

There have been reports in the press of appreciable amounts of "free silica" in the fine ash, apparently based on provisional analyses of some laboratories. This substance, a prime causative factor in the slowly-progressing illness of silicosis, occurs in nature mainly as the minerals quartz, cristobalite, tridymite, flint, chalcedony and opal. Among the particles of ash large enough to be identified with confidence under the polarizing microscope (larger than 10 microns),the U.S. Geological Survey (USGS) has been able to find only minute amounts of these "free silica" minerals. A reasonable assumption would be that the proportion in a sample of the very fine (less than 10 microns) size particles would not be significantly greater. The apparent conflict between these results and the press reports is being re-examined in the hope of clarification.

The abrasiveness of the substance identified in the ash is similar to or slightly greater than that of finely crushed window glass. Densities of these substances are 2 to 3 times greater than water. All are relatively insoluble in water, and may be expected to weather only slowly, during which process they will release some plant nutrients, such as lime, potash, and phosphorous.

Potentially harmful substances in some volcanic ash are the water-soluble materials, mostly acids and salts, that cling to the particles of glass and crystals. In the ash of May 18, the amounts of these substances were relatively small, and the steady rains of May 25-26 washed much of it off exposed surfaces. Concentrations of these water-soluble materials apparently were not large enough to significantly affect well - or surface - water supplies.

Nancy Nehring of USGS conducted partial analyses of these soluble substances which were leached from samples collected at Moscow, Idaho (about 370 miles from the volcano). The results showed:

Acidity = mild,(pH=5.7, where 7.0 is neutral).
Chlorine = 0.8 milligram per gram of ash.
Fluorine = 0.006 milligram per gram of ash.
Sulfate sulfur = 0.8 milligram per gram of ash.

Amounts of these substances may be expected to vary somewhat from sample to sample.

The chemical composition of the water-insoluble, bulk ash is that of a dacitic volcanic rock. The glass, which was molten liquid before

eruption, is a bit more siliceous. Chemical analyses of the Moscow, Idaho sample, expressed as oxides, are given below.

OXIDE	BULK ASH 1 /	GLASS ONLY 2 /
	Weight %	Weight %
Silica (not 'free silica")	65.8	71.9
Alumina	16.4	15.1
Iron oxide	4.0	2.3
Magnesia	1.4	0.5
Lime	4.1	2.3
Soda	5.1	4.7
Potash	1.7	2.1
Titanium dioxide	0.6	0.4
Total	99.1	99.3

1 / Analysis by S. Ramage, USGS, Menlo Park, Ca.

2 / Electron microprobe analysis by Charles E. Meyer, USGS,Menlo Park,Ca.

***This discussion was prepared by Ray E.Wilcox of the U.S.Geological Survey.

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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Monday, June 2, 1980

BULLETIN #9 - "Volcanic Ash Advice to Berry Growers"

The ash fallout of May 25 has caused some plant damage according to Dr. Ralph Blyther, Plant Pathologist, Washington State University.

Plants affected included blueberries, cucumbers, tomatoes, potato, corn, lettuce and some annual bedding plants.

Strawberries have not been damaged although the ash covering them may be quite difficult to remove. Processors are accepting berries that have received ashfall. Currently, raspberries present less of a problem as the fruit has not yet developed on the plant. The affect on pollination will not be known until the fruit is forming. It is recommended that pickers wear masks while in any ash-laden fields.

Damage appears as spotting decay in most cases. Young blueberry leaves showed severe marginal interveinal decay and resseting on the very young fruit. Reaction ranged from none in some varieties to quite severe in others.

High salt content of the ash probably is responsible for the damage. Ash samples analyzed at the Western Washington Research Station in Puyallup, Washington have indicated rather high soluble salts. In areas having damage, the ash has either fallen in a moist condition or the area received a very light rain following deposition. In areas where dry ash fell and has been removed by shaking, air blasts, or very thorough watering (either by rain or irrigation) there is no damage.

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Dr. Byther recommends that if the ash falls in a moist form or plants receive only a light rain, the ash should be immediately washed off by heavy watering. If the ash falls dry, shake off the ash and finish with a good wash. A dry film might be left but it would not cause any damage.

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MOUNT ST. HELENS TECHNICAL INFORMATION NETWORK

Thursday, June 5, 1980

Bulletin # 11 "Poultry - Bees - Livestock"

While the long-term health effects of Mount St. Helens' volcanic dust still are unknown, Washington State University scientists in Pullman, Washington have yet to see any animals suffering ash-related health problems, and they have conclusively determined that the fallout is not acutely toxic.

In a preliminary study on the toxicology of the fallout, Dr. William Huber, Associate Dean of Research at the Veterinary School, said the results indicate the volcanic ash has very little capacity for producing acute toxicity following ingestion. "We were extremely pleased to note that the laboratory animals, rats, are very tolerant to ingested volcanic dust," Huber said. This information matched field observation. The ash administered to the rats was equivalent to five pounds of ash consumed by a 1000 pound cow, or 20 tablespoons consumed by a human being. In order to assess the effects from drinking water contaminated with ash, a saturated solution was administered to the animals. There were no toxic effects.

Huber noted that the toxicological studies are being continued to assess longer-term effects of the volcanic ash in animal feed and drinking water. He hopes to know some of these effects in about two weeks.

Two concerns remain for livestock. The first is whether there will be any health problems associated with long-term breathing of the ash. The other is whether the ash will cause cattle, particularly dairy cows, to eat less, thus affecting milk production. Dr. Steven Davis, University of Idaho Animal Sciences Professor, said that livestock and wildlife, particularly animals which depend on outside sources of feed, are likely to develop lung congestion from the volcanic ash. This may pose some long-term health problems, depending on the condition

of the animal, its age and any previous conditions.

Because of the fine particulate size of the ash, once it is in the lungs damage could be rather severe even if there are no immediate symptoms. Chronic effects from continued exposure will show up in the quality of health or productivity of the animal later.

The effect on wildlife will be most severe on the youngest and oldest members of animal populations, especially among animals such as deer and elk which forage for food. There may be a reduction in populations as a result of the fallen ash.

Yesterday, University of Idaho Veterinary pathologist David P. Olson said livestock may have long-standing and, if exposure is severe enough, permanent damage to lung tissue, especially for those animals which graze on the ground and forage for themselves.

Dr. Olson recommends getting the animals away from exposure where possible by confining, and checking them frequently for signs of respiratory stress or dust pneumonia. If an animal appears to be having respiratory difficulty the solution is to get it away from continued exposure, hand feed the animal, and wet down its feed if it was exposed to the ash fall to keep the dust content minimized. Also, wetted ash cake , thus is less likely to break down and become airborne even when it dries. If respiratory difficulty continues or becomes pronounced, consult a veterinarian.

Dr. Olson feels that most animals will recover from exposure to the ash since animals can lose some lung capacity and still survive. Another problem, although less likely, is that great coughing may be stimulated. The ash irritation which may rupture tiny air-sacs in the lungs may eventually result in emphysema in the animals.

Clark County Washington State University Dairy Extension Agent Al Estep says that milk production is down due to dairy cows loss of appetite. Although the ash-laden pasture is not toxic it appears to affect the palatability of the feed.

Unlike dairy cows in Pullman,chicks are being fed diets consisting of up to 39% volcanic ash. They seem to be eating the ash and growing normally. Dr. James McGinnis collected volcanic ash from sidewalks the day after it fell and began feeding it to day-old chicks the next day. He divided 210 chicks into seven groups of 30. One group receives no ash in its food, providing a control to measure the performance of others. Three other groups are eating volcanic ash in their feed. One group receives 10 percent of its feed in the form of volcanic ash. Another receives 20 percent. The third is given 30 percent. The experiment is duplicated in three other groups, with ordinary sand substituted for ash. McGinnis said the comparison is being made between sand and ash because of their similar nature.

The scientists reported all of the chicks are healthy and gaining weight normally after a week on the diet. He said the chicks in the experiment have never eaten anything but the feed they are receiving in the ash study. The chicks look fine. They are active, healthy and growing at a "terrific" rate. He said if there was any toxicity in the ash, it should have been reflected within a week in the health of the chicks or in the rate at which they are growing.

McGinnis said he will continue the experiment until the chicks reach market weight in about six more weeks.

The Washington State University Animal Sciences Department is planning research projects on volcanic ash, acceptability to food animals and its effects, if any. However, these experiments will require more time to conduct because of the size of these other animals. Numerous studies have shown that the composition of the feed does not change the makeup or flavor of the milk or meat. Likewise, ash is not expected to cause any change in the quality of foodstuffs.

Seventeen percent of Washington's honey bee colonies may be wiped out by ash from Mount St. Helens, Dr. Carl Johansen, a Washington State University Entomologist, has stated. Initially Washington State University entomologists thought honey bees would survive reasonably well because warm weather preceding the mountain's eruption had enabled bees to establish supplies of food and populations of brood and hive bees were high. However, Johansen said the entire honey bee field force in the area was annihilated. Until rains occurred, the field bees that left hives each day died. Although moderate to heavy rains cleansed plants early this week, Johansen said as soon as the ash dried it was carried into the air and continues to plague the bees. When the colony becomes too weak to clean itself, the uncapped brood begins to die from dust contamination. Housekeeping bees are lost when they become contaminated with ash on landing boards, Johansen said.

Lack of summer pasture long has been a serious problem for Washington's beekeepers and Johansen expects the volcanic ash to further restrict bee pastures this summer. Beekeepers are recommended to move hives outside the ashfall area. As this will place extra demands on pastures in other areas, beekeeper associations may want to locate and arrange for pastures. The scientists said Washington has 70,000 commercial bee colonies. About 15,000 of them are in areas that received

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the heaviest ashfalls. Johansen expects at least 12,000 of these to be destroyed. He said beekeepers are estimating their losses at 2 million dollars from severe reduction of honey production, loss of normal colony increase, loss of summer pollination fees, loss of contaminated beeswax (which cannot be salvaged), and losses to normal operations that cannot be carried out. Special costs of equipment and labor expended to cope with the ashfall also are involved. Johansen said the industry should be able to bounce back with normal bee populations next year.

FEDERAL COORDINATING OFFICE
federal emergency management agency

MOUNT ST. HELENS TECHNICAL INFORMATION NETWORK

Friday, June 6, 1980

Bulletin # 14 "Protecting Children From Volcanic Ash-Related Health Hazards"

Previous Technical Information Bulletins have discussed the health hazards of the volcanic ash (Technical Information Bulletin #8 and #10) and precautions that can be taken in ashfall areas (Technical Information Bulletin #3). At this time, short term exposure to the ash is not considered a significant health threat to the general public.

Children may face the same hazards from the suspension in air of volcanic ash as other age groups, except they are unlikely to be routinely exposed to heavy concentrations of ash as are certain occupational groups. However, their exposure may be increased because they are physically smaller and are less likely to adopt reasonable, prudent, preventive measures to avoid undue exposures.

A preliminary study of the effects of the ashfalls of 5/18 and 5/25 on high risk pediatric populations has been initiated by the University of Washington Schools of Medicine and Public Health. At this time, it does not appear that asthmatic children in the paths of these ashfall plumes have had any significant increase in their symptoms compared to children with similar respiratory problems who live in unaffected parts of the state.

The volcanic ash may cause irritation of the lungs or exacerbation or symptoms in children suffering respiratory illness (asthma, cystic fibrosis, tuberculosis). Preliminary samples of the ash show only low levels of free crystalline silica (5% by weight of the inhalable ash).

At this time we do not know whether continued periodic emissions of volcanic ash, persistence of airborne ash in the respirable size-range, and extended inhalation of low levels of the ash over long periods of time could potentially cause chronic respiratory disease or silicosis among the general population, including children.

The most obvious step that can be taken to protect children from inhaling airborne ash is to keep children indoors when ash is visible in the air. Children should certainly be advised against strenuous play or running when ash is in the air, since exertion leads to heavier breathing, drawing small particles more deeply into the lungs. Parents might plan quiet games and indoor activities during such times. Communities in heavy ashfall areas may wish to organize day-care programs to reduce the economic burden on working parents.

If children must be outdoors when ash is present in the air, they should wear a mask, preferably one marked with "TC-21C" and approved by the National Institute for Occupational Safety and Health (NIOSH). However, commercially available masks are manufactured for industrial use and therefore are designed to fit adults rather than children. One such approved mask, Number 8710 of the 3M Corporation, is stated by the manufacturer to be adaptable to children as young as 5 years.

Fabric masks, including those improvised from handkerchiefs, will filter out the larger dust particles, and should be dampened with water to be used when the dust is visible in the air if no approved mask is available. For children old enough to understand the difference, it might be helpful to breathe through the nose, where natural filtration of large particles takes place.

Small children may at times swallow some of the ash. Evidence to date suggests that ingestion of ash is not a hazard to the health of children and adults.

Children should certainly be prevented from playing in areas where ash is deep on the ground or piled up, especially if they are likely to lie or roll in the ash. More frequent cleaning of home interior areas where children play will minimize the amount of indoor ash exposure in areas of heavy past or future ashfalls.

Since there is the potential for further ashfalls, it would be appropriate for families to obtain a mask for each member and to discuss their use. Families who live in the tornado "belt" or in flood danger areas have formulated plans for emergency responses to these natural disasters. Similarly, families in the areas potentially exposed to ashfall should prepare for such contingencies.

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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Monday, June 16, 1980

BULLETIN #19 - "Controlling Blowing Dust from Volcanic Ash"

Deposits of volcanic ash, including quantities removed from roadways, etc., continue to be troublesome because the ash is blown by the wind and is tossed up by passing vehicles. A variety of materials can be used to suppress blowing dust through formation of a crust. This is generally a highly successful approach, at least until the crust is broken. The U.S. Army Corps of Engineers has used some of these and made certain recommendations, noting that manufacturer's instructions should be followed and that the Corps does not guarantee or accept responsibility for any specific product. Specifics on costs and decisions as to which materials to use vary according to local circumstances.

Agricultural Lime

Chemical analyses of various samples of the ash material (Bulletin #8) show that while its composition does vary, its content of silica, alumina, and iron oxides does meet the minimum ASTM chemical requirements for a cement binder (known technically as Type N or F pozzolan), and compares favorably with such materials used in the concrete for many Corps of Engineers construction projects in the Pacific Northwest. In the binding reaction, the oxides in the volcanic ash combine chemically with hydrated lime to form cementing compounds similar to those formed in the hydration of Portland Cement. At least 5% hydrated, agricultural type lime (by weight) would be required for this reaction to occur. The cementation process proceeds considerably slower than for Portland Cement, but in

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time, cement mortar strengths may be attained. Dust control would be effected by the formation of a crust on a stockpile or roadside accumulation which would be resistent to wind erosion if left undisturbed. The lime should be applied to the surface of the ash in the form of a slurry suspension or a solution, by means of a spray bar. If applied in a lime-water solution, several applications will likely be required to supply a sufficient concentration of lime to the ash surface because of the lime's low solubility (approximately 1.1 lbs/100 gallons of cold water). For existing gravel surfaced roads, some practical use could also be made of the ash material itself by mixing it with either in-place or borrowed sands and gravels, a minimum of 5% (by weight) of lime, and sufficient water for compaction placement, to form a low quality type concrete similar to soil cement or cement treated base. This procedure could serve to increase the quality of existing gravel surfaces or could be used to produce a stabilized base course.

Lignin Sulfonate

An ammonia base wood liquor by-product of the paper pulp industry that can be used for dust control, it is moderately hygroscopic (retains moisture) and the wood sugars act as a binding agent. It has been found not to work well on materials such as decomposed granite which remain coarse upon weathering. It is used as an annual dust control measure in some Eastern Washington counties with applications effective for about four months. It is also sprayed on dust to facilitate blading into windrows for pickup. It is produced in the form of a 50 percent solids liquid, and is generally diluted with two to four parts water. For availability, price information and application rates, contact any major paper manufacturer.

Lion Prime

A penetrating asphalt component (similar to items known in the trade as MC 30 or MC 70 asphalt cutback with kerosene) was developed for soil stabilization and dust control for helicopter landing areas in Vietnam. It is used by some states for stabilization of road shoulders and is also used in spray application on coppermine tailings to control very fine powdery dust. It will effectively penetrate two to three inches and act as a binding agent, but will decompose after several years.

Coherex

A dust palliative also developed for helicopter landing areas in Vietnam, is an asphaltic wax emulsion (similar to items known in the trade as CRS-1 and CRS-2) used by lumber companies and the Forest Service as a dust palliative on forest roads. It makes dust fines heavier so that passing traffic will not cause them to rise higher than about three feet. In Redmond, Oregon, a 4:1 dilution was sprayed on volcanic ash stockpiles to form a wind-resistant crust on the surface. For traffic use, a standard application is ½ gal/sq yard of the 3:1 or 4:1 solution. However, it can be used in up to 10:1 dilutions for forming light membranes. The Washington State Highway Department has made trial applications along I-5 at dilutions of up to 8:1.

Emulsified Asphalt SS-1-1-1

This is a hard base emulsified asphalt which can be diluted with water up to 10:1. It should not be used in areas of pedestrian traffic because it will stick to shoes. It is available from most major asphalt companies, who can also advise on costs and application rates.

Slow Cure Oils

This term is applied to soft asphalt which will also control dust but does create an oily surface. Costs and application rates are also available from most major petroleum companies.

Additional information may be obtained by contacting:

Materials Laboratory
U.S. Army Corps of Engineers
Division Engineer, North Pacific
Troutdale, Oregon
(503) 665-4166

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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Monday, June 16, 1980

BULLETIN #20 - "Health and Medical Update"

Shortly after the eruption of Mount St. Helens on June 12, personnel from the Center for Disease Control and National Institute of Occupational Safety and Health began sampling ash that fell in the Vancouver, Washington-Portland, Oregon area. Additional samples from other locations in the path of the plume will be collected. Chemical and physical properties will be analyzed and compared with those in the previous ashfalls.

Emergency Room Visits in Moses Lake, Washington, May 4-31, 1980:

After the first eruption (May 18, 1980) Moses Lake, Washington, located 150 miles northeast of Mount St. Helens, received 2-3 inches of volcanic ashfall. Most of the physicians' offices were closed May 18-26, and the residents were told to go to the hospital emergency room (ER) for medical emergencies only. The second eruption (May 25, 1980) did not affect Moses Lake, since the plume moved southwesterly to northwesterly from the volcano. For the week immediately after the first eruption (May 18-24, 1980), the hospital in Moses Lake experienced a 40% increase in ER visits. This increase can be explained partly by visits of patients who would have gone to their own physicians for services such as medication refills and allergy injections. However, patterns emerge when the types of ER visits are examined separately.

Accidents and injuries: A number of ash-related accidents and injuries occurred during the first week after the first eruption. These included

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motor vehicle accidents and falls from ladders as residents tried to clean the ash off their rooftops. The overall number of accident-injury ER visits actually decreased because of a 45% reduction in the number of visits for other injuries. The injuries in the 2 weeks preceding the eruption were largely due to sporting and recreational activities, such as fishhook injuries.

Respiratory conditions: Marked increases in the visits because of upper respiratory infections (URI), asthma, and other pulmonary conditions, such as bronchial irritation from ash inhalation, were seen in the ER after the eruption. The increases in URI and asthma persisted through the second post-eruption week. Smaller increases were also seen in the number of visits because of bronchitis and chronic obstructive pulmonary disease (COPD) or emphysema. Twelve patients were hospitalized for pulmonary conditions in the 2 weeks after the eruption, compared with only 4 in the 2 weeks preceding eruption. The admission diagnoses included pneumonia, asthma, acute and chronic bronchitis, COPD, or emphysema, and a case of hemoptysis.

Other emergency room visits: The number of ER visits because of otitis increased during the first but not the second week after the volcanic eruption. It is possible that these patients returned to their private physicians after May 27, when the physicians reopened their offices. The number of eye complaints, mainly foreign bodies, did not increase after the ashfall. Visits because of psychiatric complaints did not increase.

The closing of physicians' offices for 9 days after the eruption confounds the interpretation of ER visits during this period.

Hospital Emergency Room Visits and Hospital Admissions for Pulmonary Conditions, Washington, May 11-June 7, 1980

Eleven eastern Washington hospitals and 10 western Washington hospitals are included in a surveillance system to monitor emergency room (ER) visits and hospital admissions before and after the volcanic eruptions. The eastern hospitals are located in areas affected by ashfall from the first eruption on May 18, 1980; the western hospitals are in areas affected by ashfall from the second eruption on May 25, 1980.

Eastern Hospitals: Compared with the week before, the ER visits for pulmonary conditions increased abruptly in many hospitals the week after the May 18 eruption. These hospitals are in areas with moderate-to-severe ashfall---including Ritzville (2-3 inches), Moses Lake (2-3 inches), Othello (1¼ to 1 3/4 inches), and Spokane (¼ to ½ inch). The greatest increase in pulmonary ER visits (from 1 to 34) was in Ritzville, the town receiving the most ashfall. In Yakima and Spokane, the increase in visits persisted through the second and third post-eruption weeks. But in Ritzville, Moses Lake, and Othello, the number of pulmonary ER visits returned to pre-eruption ranges by the third week (June 1-7, 1980) after the eruption. These areas also experienced a concurrent increase in hospital admissions for pulmonary conditions after the May 18 eruption.

Western Hospitals: In Centralia, where the ashfall was heaviest (1 inch) after the second eruption of May 25, the number of pulmonary ER visits increased in the first week (May 25-31, 1980) after the eruption. Slight increases in pulmonary ER visits were also seen in Longview and Aberdeen in that week. By the second week after the eruption (June 1-7, 1980), most of the hospitals had weekly pulmonary ER visits similar in numbers to the pre-eruption period. Little or no increase in pulmonary

ER visits was seen in McCleary and Shelton---areas with approximately 1/8 inch of ashfall.

Unlike the hospitals in eastern Washington, the western Washington hospitals did not have significant increases in hospital admissions for pulmonary conditions after the May 25 eruption. This appears to be true even for Centralia, where an increase in pulmonary ER visits occurred.

Discussion: Available information to date indicates an icrease in hospital ER visits and admissions for pulmonary conditions after the 2 eruptions, but only in more heavily affected areas. A number of factors may account for the differences in morbidity between the eastern and western hospitals, including the amount and composition of the ash and the amount of rain after the eruption. A more detailed surveillance system in these hospitals has been initiated to provide additional information on ER visits, admissions and clinic visits for diagnoses that may be related to volcanic ash. These data will be compared to data from a similar period in 1979.

Mortality Associated with the Eruption of May 18, 1980

Information on the locations, causes and circumstances of death of the victims of the May 18 eruption is being collected. This information will be useful in epidemiologic analysis of the mortality patterns resulting from a volcanic eruption and will be reported in a future Bulletin.*

* FROM: CDC--Mount St. Helens Volcano Health Reports #5 and #6, June 10 and June 13, 1980.

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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Friday, June 20, 1980

BULLETIN #21 - "Aviation Considerations"

Safety information and recommended actions associated with aircraft exposure to volcanic ash were promptly distributed by the Federal Aviation Administration (FAA) and some aircraft and engine manufacturers after the first major eruption of Mount St. Helens. The immediate concern included exposure to ash in the air and on the ground. While the high altitude concentrations have diminished, recurrence associated with future volcanic activity can be expected and the possibility of ground contamination is a continuing problem.

Several incidents have been reported that involved flight through an ash cloud. Two airplanes that were briefly exposed to the airborne dust cloud with extremely high particulate concentration, had windshields and engine fan blades pitted. The most extreme example, which was reported in Aviation Week and Space Technology, involved exposure of a Transamerica Airlines Lockheed L-100 transport taking off from McChord A.F.B. at Tacoma, Washington, May 25, 1980. In less than five minutes exposure to a heavy concentration of ash, two turbines were destroyed and the other two were severely damaged. The radome, wing leading edges, propeller and windshields were reported to have sustained sandblast damage.

Extreme incidents such as these can be avoided. After each of the eruptions, data is provided through FAA Advisories and NOTAMs, (Notice to Airmen) forecasting the location of airborne dust clouds. Flight restrictions in the immediate vicinity of the volcano will be in effect

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for the foreseeable future. Current information can be obtained from any FAA Flight Service Station.

Airports have been closed for extended periods in the presence of heavy dust and can be expected to be closed again. Even without additional eruptions, the combination of dry weather and wind will cause recurring problems from the present ash in some areas. Closure of the airport is the responsibility of the owner/operator of the airport. The FAA notifies pilots of such closures through their NOTAMs system.

In addition to following instructions as to flight restrictions and the like, FAA and manufacturers' instructions for maintenance, cleaning and operations must be followed to avoid damage to equipment. Much information has been disseminated by government and industry. These are discussed at length in the June 9, 1980 issue of Aviation Week and Space Technology. The advisories from the aircraft and engine manufacturers are reproduced on pages 41-45. Further, all agencies and individuals involved in operating aircraft near the volcano or in ashfall areas must refer to the May 21, 1980, FAA special issue of General Aviation Airworthiness Alerts titled "Volcanic Ash Hazard" (AC No. 43-16). This publication has been distributed to all fixed base operators, all aircraft owners and all pilots of record in the region. Copies remain available at all FAA Flight Service Stations.

Manufacturers advisories of record include the following:

Boeing (Special message) May 23, 1980.

Boeing (Customer support service letters) May 29, 1980.

McDonnell-Douglas (Advisory to operators) May 22, 1980.

Lockheed (Deferred because few if any operations in the area).

General Electric (Engines) May 21, 1980.

Pratt & Whitney (Engines) May 21, 1980.

Rolls Royce (Engines) May 22, 1980.

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MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Friday, June 20, 1980

BULLETIN #22 - "Electric/Electronic Protection---Commercial and Major Systems"

Volcanic ash from eruptions of Mount St. Helens presents several classes of problems for electric and electronic systems:

* Abrasion of moving parts, especially rotating elements.
* Jamming of mechanical components.
* Shorting or grounding of circuits.
* Etching of painted and metal surfaces.
* Generation of excessive heat under a blanket of dust or because of obstructed vents.

In general, the severity and frequency of such problems can be reduced through good housekeeping and sound maintenance programs. These measures apply to mechanical as well as to electrical systems. For example:

* Sensitive systems should be isolated from dust.
* Insulators should be kept clean.
* Rubbing and brushing should be avoided.
* Programs of protection or cleaning should be continuous because of the recurrence of blowing ash.

The foregoing are confirmed by reports from power and communications organizations operating in the ashfall area. Few actual outages have been recorded, but the potential for such problems persists. Specific difficulties reported include:

* Difficulty in operating electro-mechanical items, such as

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unprotected switches.

* Insulator flashover (and resultant fires in wooden power poles) due to wet ash deposits.
* Corrosion of copper/brass and ferrous metals by wet ash (confirmed by laboratory tests).
* Irrigation pump burnout due to heat buildup caused by ash deposit.
* Higher rate of drive belt wear.
* Contamination of protected spaces by air conditioners that use outside air.

Suggested measures to prevent problems or reduce their severity include:

* Electrically isolate all systems before attempting to clean or service them. Throw circuit breakers, not merely a wall switch.
* Keep the dust out of the building. Techniques include sealing doors and windows; adding filters to air systems (caution: avoid overloading fans--place filters on intake side of fans); creating positive internal pressure by use of filtered fans; providing brushes and mats to clean people and cargo before they enter; frequent vacuuming around entrances, preferably with the vacuum exhaust outdoors; and reducing traffic and the number of entrances.
* Keep sealed units sealed. Many solid-state devices are well proctected as is and most computer cabinets are sealed except for fan ducts. Filters can be applied to the ducts but care must be taken to avoid overloading the fans or they could catch fire. Units not in use should be kept well sealed either in storage containers designed for the purpose or with plastic material well sealed with tape.
* Blow dust off. Rubbing and brushing can damage many surfaces,

but uncontrolled use of air hoses can also cause problems. 30 p.s.i. or less is generally proper for blowing items clean as more pressure may sandblast. Care must be used to avoid blowing it onto other places that should be kept clean. Better yet, vacuum clean when possible. Be sure to clean or change filters and vacuum bags frequently.

* Keep electric components clean. Excess heat is generated by single components such as light bulbs or small motors (in refrigerators, etc.) when blanketed with dust. This shortens operating life and can cause fires. The dust should be vacuumed or blown off (see paragraphs above for precautions). The same applies to household radios, TV's, etc. Professional maintenance may be needed if ash is heavy.
* Keep insulators clean. A moderate wind will clean dry (new fallen) ash from most outdoor insulators. Light rain does not remove ash, and actually causes problems by providing a conducting path. Heavy rain washes insulators quite well but if wet ash dries in place, high pressure water streams and hand cleaning may be needed.
* Keep power lines clear. Trees loaded with ash can cause interruptions in the same manner as in the case of snowfall or ice storms.
* Avoid drowning out components when hosing dust off. Many exterior systems will handle rain or casual water but not hose jets. Washing automobile engines is usually safe, but drying time might be needed.

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* Keep backup or auxiliary units protected from ash dust as long as possible to avoid startup problems.

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Sources for information used in this bulletin include:

Bonneville Power Administration
General Telephone Company of the Northwest
Pacific Northwest Bell
Washington State University

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federal emergency management agency

MOUNT ST. HELENS
TECHNICAL INFORMATION NETWORK

Saturday, June 21, 1980

BULLETIN #23 - "Farm Equipment 'Ash' Maintenance"

(The following advice is provided by Gary M.Hyde, Ph.D., and James M. Ebeling, Washington State University, and also includes material from the International Harvester Company. It is directed to farmers and those operating field equipment. It does not speak specifically to individual pieces of equipment but does contain information that should be helpful for a variety of equipment.

For more information on off-field vehicle maintenance, see Technical Information Bulletin #2b-"Driving and Vehicle Maintenance in Heavy Ash Areas." TIB #6 also will be helpful.)

CHARACTERISTICS OF THE ASH

The ash consists of pumiceous glass; feldspar, hypersthene, and magnetite crystals; and lithic fragments (igneous rock). These minerals are made up of calcium, sodium, aluminum, magnesium, iron, silicon, and oxygen, just as our soils are.

These materials are abrasive and may be corrosive to untreated or painted metals due to the sulfuric acid and flourides and chloride salts. It is recommended that all vehicles be thoroughly cleaned, inside and out. Vacuum or air-clean vehicle prior to a thorough rinsing with fresh water.

FIELD EQUIPMENT ASH MAINTENANCE

AIR CLEANER FILTERS

Information regarding the filters will be emphasized in this bulletin because some of the most expensive repairs may result if the abrasive ash gets inside engines.

Air cleaner filters in good condition should remove any harmful particles. New air filters are designed to screen out particles

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larger than 20 microns, but remove smaller particles down to 10 microns as opening sizes become restricted. Although a small percentage of particles less than 20 microns in diameter can pass through the filter, they become suspended in the oil film between moving engine parts.

Engines are designed with an oil film that is 25 microns thick. Thus even small concentrations of abrasive ash particles smaller than 20 microns will cause undue engine wear. Contrary to popular opinion, quality dry-type filters are more efficient than oil bath filters. Dry filters remove 99.9 percent of the harmful particles, while oil bath filters remove 98 to 99 percent. The efficiency of an oil bath filter is significantly improved if a paper filter is installed in front of it. Do not place an oil bath filter in front of a paper filter, because oil from the oil bath filter will be carried onto the dry filter, making it difficult to clean.

Both filter and tractor manufacturers recommend that you not change air filters until your restriction indicator tells you to change or you notice a loss of engine power. The reasons are a visual inspection will not give a good reading about filtering ability and partially restricted air cleaner actually is more effective, up to a point where it does not allow enough air through for proper engine performance. Carelessness when changing air filters can also cause engine damage.

Service your air cleaners according to manufacturer's specifications for dusty operating conditions. Make sure, however, that the air filtering system is properly installed and that all connections are tight and leak-free. In addition, it is recommended that the air intake be elevated, making sure that extensions are tight and not so high as to hit wires or other obstructions. Cleaning air filters with low

pressure air is recommended. Replace if necessary only when excessively clogged. Visually inspect air cleaner element seals. When replacing the element remove all seal material from the cannister. If seal material is not removed, the new filter element may not seal properly.

When you replace an air cleaner, follow these steps to avoid damaging your engine:

1. Your engine compartment probably will be covered with a layer of dust. Wash off with water, being careful not to spray water directly into the air intake opening.
2. Before removing the air filter cover, clean it thoroughly by tapping it gently to dislodge any dirt that may have collected under the outer rim of the cover. Now remove the cover, taking care not to get any dust or dirt into the carburetor opening.
3. Place a damp cloth in the carburetor opening to prevent any dirt from getting in while the cover is off. Gently remove the air filter.
4. If you do not have a new filter, clean the old one with a vacuum cleaner. DON'T use high pressure air (use 30 psi or less) because you may blow a hole in the filter. DON'T use water or solvent to clean the paper filter. Be careful not to get any dust on the inside surfaces of the filter.
5. Vacuum the inside of the filter basin and wipe it out with a damp cloth.
6. Replace the cleaned filter or put in a new one. Be sure it is properly sealed!
7. REMOVE THE RAG FROM THE CARBURETOR.

8. Replace the lid and seat it properly. Put a gasket---cardboard will work---around the wing nut to prevent any air leakage there.
9. Check all fittings in the air filter system to be sure everything is tight and there are no air leaks.
10. Try to perform maintenance work in dust-free areas. Clean around all openings before removing plugs, filters, dip-sticks,etc.

LUBRICATION SYSTEM

Frequent oil and filter changes will be required. Manufacturers of farm equipment are recommending oil changes at least twice as often as normal. Also lubricate ball joints, suspension and other fittings more frequently than normal, using grease to force the grit out of joints.

Engine oil and filters should be changed every 50 hours of operation. Drive train maintenance should be performed at this time.

Service the crankcase breather every 100 hours of operation or as required.

HYDRAULIC SYSTEM

Hydraulic and transmission systems are relatively closed systems and thus the most potential source of ash contamination is through carelessness with remote couplers. Hydraulic filters should be replaced more often than usual (every 100 hours is recommended in ash conditions), and breathers should be checked for ash accumulation. Transmission filters should be inspected and replaced if necessary. Breathers in gear boxes may plug and should be cleaned following manufacturer's specifications. Cooling systems should be routinely checked for ash build-up that could cause overheating.

FUEL SYSTEMS

In-line filters need to be routinely checked or installed on all engines, even gasoline engines. Seventy gallons of gas means seventy gallons of dusty air as the tank empties. Also check filler cap gaskets routinely.

Fuel filter should be replaced as indicated by lack of power or performance of the engine.

Fuel tank vents and caps must be cleaned more frequently.

Exhaust system should be "capped" when not in operation to prevent ash deposit entry on a static engine.

MECHANICAL PARTS

Sickle knives, wear plates, and similar devices become "ground engaging" as a result of the extreme amounts of dust generated during field operations, resulting in higher wear rates. Chrome plating or hard facing of rasp bars and other similar parts may prove beneficial. Higher rates of wear can be expected for roller and steel chains and sprockets. Whether or not these should be lubricated is left to the individual operator, because no clear guidelines exist. V-belts and pulleys should be checked for alignment and tension. Due to the polishing action on pulleys from the dust on belts, more tension in belts may be needed to deliver the same torque.

SEALS

The ash will wear out seals more rapidly, so bearings should be repacked more often than normal. Positive oil pressure should minimize ash entry into front and rear crankshaft.

-MORE-

AIR CONDITIONERS AND FRESH AIR SYSTEMS

As expected, filters should be cleaned or changed more often. The compressor is normally well shielded and designed for hostile environments, although the clutch and pulleys may show additional wear.

PAINT AND OTHER SURFACE FINISHES

Some of the ash is very fine and can work its way into any opening or crack. Thus, both the exterior and underbody of vehicles should be washed more frequently, preferably with a high pressure hose. Do not brush or remove the ash with a dry cloth. It may scratch the finish.

OTHER SYSTEMS

Problems with generators, alternators, and starters can be anticipated. Compressed air with 30 psi or less is suggested for dust removal. High pressure could have a sand-blasting effect. Take care not to blow the ash from one spot to another that might be even more susceptible to damage. Radiators, condenser cores, oil coolers and other machinery parts may show accelerated corrosion and wear due to the abrasive ash. Small electric motors in various and sometimes out of the way places could be covered with ash and overheat.

BULLETIN # 24 - "Vehicle Maintenance Guidelines"

This bulletin supplements previously issued material, especially TIB #2b. Where TIB #2b is written for auto drivers, this bulletin is written for service stations, garages and others involved in maintaining passenger vehicles and light trucks. It reflects available recommendations from manufacturers of automobiles and parts. Guidelines for use in dealership garages have been distributed by major manufacturers. In general, these recommend increased frequency of all normal maintenance procedures for U. S. and foreign cars. The General Motors message to drivers, published in major newspapers in the ashfall area June 6, 1980, is consistent with the guidelines.

Note: The following portions of this bulletin are being reproduced on card stock and will be distributed free of charge by FEMA to the automotive trade in the ashfall area.

MAINTENANCE GUIDELINES FOR USE IN AREAS WITH VOLCANIC ASH

General - Use air (maximum 30 psi) to blow dust from open electrical equipment, such as the alternator, starter, windshield wiper motor etc. (500-1,000 miles per G.M.) Clean brake assemblies with compressed air (50-100 miles per G.M.) or monthly to 90 days (per Ford). Clean the automobile completely including the engine, radiator, etc. as often as daily if necessary. Use water to flush material off. If available, use more complete instructions from vehicle manufacturer.

Passenger Compartment - Cover air intake to ventilation, heater, or air conditioning system with loosely woven felt-type material.

Air Cleaner - Use of heavy duty (HD) air filters is recommended. Inspect the air filter frequently, and clean using compressed air (30 psi) to remove dust from the filter element, blowing from inside out.

-MORE-

Examine the filter for damage to the seal and for holes or cracks in filter material. Replace if necessary.

Recommended Inspection Frequency:

Ford	100 miles
Chrysler	100-300 miles (heavy ash - visibility up to 50 feet) 1000 miles (light exposure - visibility up to 200 feet)
G.M.	"often"

NOTE: G.M. recommends use of a H.D. filter consisting of a standard paper element with a wrap of open-cell polyurethane around the outside. The polyurethane wrapper is available as a separate item from AC-Delco distributors and can be added to a conventional filter.

Instructions are not available on fabricating the wrapper locally. A light coat of SAE-30 weight oil must be sprayed on the polyurethane wrapper; if spraying is not possible, dip it in oil and squeeze out ALL excess oil before installing. The wrapper can be washed in warm water and detergent and reinstalled after retreatment with oil. Replace the paper filter after three washings of the wrapper.

A chart with AC-Delco part numbers and filter dimensions is attached. Chrysler recommends use of a polyester wrap that fits around a standard paper filter. This part can be obtained from any Chrysler parts distributor, and can be re-used by shaking and cleaning with air. Polyester wrap part numbers for Chrysler engines are summarized on the following page.

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Chrysler Engine	Polyester Wrap Part No.
225	3830141
318	3830142
360 (single snorkel)	
400 (double snorkel) 440	3830144
400 (single snorkel) 440	3870370
318 360 (med. duty truck only) 361	3830143

Fuel Filter - Ford recommends service at 1000 mile intervals. Other manufacturers have not recommended special consideration. Be aware that a twenty gallon gas tank means twenty gallons of dusty air.

Oil Change and Oil Filter Change

	Recommended Interval
Chrysler	1000-3000 miles
Ford	500 miles
G.M.	500-1000 miles 50-100 miles (heavy ash)

Lubrication - Lubricate monthly for continuous operation and every 90 days for normal operation according to Ford. Fittings should be cleaned carefully.

Pollution Equipment - Service PCV valve and change ECS filter as follows:

Recommended Interval

G.M. - when air cleaner is serviced.
Ford - 100 miles
Chrysler - when oil is changed.

-MORE-

Drive Train - Clean air vents on transmission and differential; cover with loose felt material (as used to filter air into passenger compartment). Ford suggests changing transmission fluid and filters as follows:

1000 miles - (continuous operation)

4000 miles - (normal operation)

AC H.D. POLYURETHANE FILTER WRAP (ASH-WRAP)

H.D. Poly-Wrap No.	Height Inside	Diameter Inside Unstretched	Application Parameters: In. Dia. +.5 in. Min Stretch	In. Dia. +1.5 in. Maximum Stretch	Std Filter used with this Poly-Wrap	H.D. Filter it Makes	Known Application	Pop Code
25041250	5.72 In.	10.3 In.	10.8 In.	11.8 In.	A269CW	A222C	A269CW Air Filter Element 1976-66 Chevrolet Truck V6, V8	C
25041251	4.15	12.0	12.5	13.5	A697C	A644C	A697C• Air Filter Element 1979 Cadillac Models V8 350 Diesel 1979 Oldsmobile Models V8 260, V8 350 Diesel	N-C
25041252	2.62	12.0	12.5	13.5	A366C	A542C	A366C Air Filter Element 1978,75-70 Firebird V8 400, 403, 455 1975,72-71 Tempest/LeMans V8	C
25041253	3.16	12.0	12.5	13.5	A212CW	A279C	A212CW Air Filter Element 1979-68 Buick Models V8 1973-66 Chevrolet Models V8 1979-66 Oldsmobile Models V8 1979-67 Pontiac Models V8 1979-76 Cadillac Models V8 350	A
25041254	3.54	11.0	11.5	12.5	A348C	A477C	A348C Air Filter Element 1979-75 Buick Models V8 1979-68 Chevrolet Models V8 1979-71,68 Chevrolet Truck V8 1979-73 GMC Truck V8 1979-75 Oldsmobile Models V8 260, 305, 350(L) 1979-75 Pontiac Models V8	A
25041255	3.65	8.7	9.2	10.2	A178CW	A333C	A178CW Air Filter Element 1979-77 Buick Models V6 231 1979-70 Chevrolet Truck V8 1969-64 Corvair L6 1979-64 GMC Truck V8 1979-78 Malibu V6 200 1979-77 Oldsmobile Models V6 231 1979-77 Pontiac Models V6 231	A
25041256	3.12	10.3	10.8	11.8	A86CW	A223C	A86CW Air Filter Element 1959 Buick V8 1956-59 Chevrolet Models V8 1967-59 Pontiac V8	C
25041257	3.15	12.0	12.5	13.5	(A355C?)	A680C	A680C• Air Filter Element 1979 Eldorado V8 350 Diesel 1979 Toronado V8 350 Diesel	N-C
25041258	2.62	9.38	9.88	10.88	A331C	A277C	A331C Air Filter Element 1974-61 Oldsmobile Models V8 1976-65 Pontiac Models V8	B
25041259	3.12	9.38	9.88	10.88		A276C	A276C Air Filter Element (Heavy Duty) 1975-66 Chevrolet Truck L6 250, 292 1974-70 GMC Truck L6 292, V8 350	D
25041260	1.98	8.7	9.2	10.2	A169C	A227C	A169CW Air Filter Element 1974 Apollo L6 250 1976-75 Buick Models L6 250, V6 231 1979-62 Chevrolet Models L4, L6, V6 196, 231, V8 1971-64 F85/Cutlass L6, V6 1976-75 Oldsmobile Models L6 250, V6 231 1974-73 Omega L6 250 1979-64 Pontiac Models L6, V8 305, V8 307 1978-75 Skyhawk V6 231 1971-62 Special/Skylark L6 250, V6, V8 350 1979-75 Starfire V6 231	A
25041261	2.55	11.0	11.5	12.5	A329C	A368C	A329C Air Filter Element 1979-69 Buick Models V6 196, 231, V8 1979-68 Chevrolet Models V6 231, V8 1979-68 Chevrolet Truck V8 1979-68 GMC Truck V8 1979-75 Oldsmobile Models V6 231, V8 301, 305, 350 1979-75 Pontiac Models V6 231, V8 301, 305, 350	A

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