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16. Abstract (Limit: 200 words)

The search and rescue (SAR) response to the Mount St. Helens disaster is analyzed. An overview of past research is provided as is a description of how Washington's SAR community responds to typical SAR demands on a daily basis. Federal, state, and local disaster planning efforts and the nature of interorganizational linkages among the responding agencies are examined. Three aspects to the SAR response are discussed: (1) the sequence of events during the main SAR operation around the mountain; (2) SAR activities in the ashfall area of Moses Lake and Ritzville; and (3) preparations for a possible SAR response to future eruptions of the still active volcano. Similarities between volcanoes and earthquakes are noted. Recommendations for a more effective approach to emergency management are made, including: (1) emergency response managers should adopt an open systems perspective in both disaster planning and response; (2) Federal disaster policy should adopt a proactive approach to disaster predictions; and (3) emergency response managers should recognize the uncertainty of disaster predictions.

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THERE SHE BLOWS: THE SEARCH AND RESCUE RESPONSE TO THE MOUNT ST. HELENS VOLCANO

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

EXECUTIVE SUMMARY

On May 18, 1980, a major eruption at Mount St. Helens had an unprecedented impact upon the local communities surrounding her slopes, the State of Washington, and the entire country as well. A combination of a lateral blast, ash eruption, mud and pyroclastic flows, and flash flooding, created a set of unique and inordinate demands. These demands necessitated a search and rescue (SAR) response, the magnitude and complexity of which went far beyond that of most natural disasters in the United States.

This report presents a systematic and comprehensive analysis of the SAR response to Mount St. Helens. Sources of data included face-to-face interviews with 46 organizational representatives and structured questionnaires from each of the sampled organizations. Additional data relevant to SAR activities such as organizational documents and media publications, were collected whenever possible to augment our primary data base.

Using these data, as well as data previously collected on SAR in Washington State (see Technical Report #6), the report provides an in-depth discussion of: 1) the structure of the Washington State SAR Community; 2) prior planning activities for a Mount St. Helens eruption; 3) the organizational SAR responses to the May 18 eruption; and 4) the emergent multiorganizational SAR system. The report concludes with a discussion of operational problems and observations.

We discovered that the Washington State SAR Community had created an interorganizational system, with the State Department of Emergency Services (DES) as the central agency, of linking local SAR needs to state and federal resources. Over 300 local, state, federal and volunteer

organizations participated in this system. And it appeared to work fairly well for the 4-500 routine, remote setting SAR missions it responded to each year.

With the reawakening of Mount St. Helens on March 20, 1980, SAR authorities began to plan for a major eruption which was expected to occur at some point in the future. The U.S. Forest Service sponsored an inter-organizational planning effort which culminated in the establishment of an Emergency Coordination Center. An attempt was made to keep people away from the mountain. Specific evacuation procedures for the major anticipated threat, flash flooding, were formulated. Swift Reservoir was lowered and contingency plans were written by the State DES and the National Guard. Each of these actions, however, was predicated on what was predicted to occur during a major eruption by scientific experts from the U.S. Geological Survey (USGS).

Certain aspects to the planning efforts help to explain why, in hindsight, the SAR response unfolded as it did. A lateral blast was not predicted to occur. A large-scale multijurisdictional SAR operation was not anticipated and, therefore, not planned in any specific manner. Lewis County officials were minimally integrated into the various plans. The State DES had no full-time SAR Coordinator. And National Guard plans were not interorganizational in nature or even communicated to other response agencies.

Underlying factors that pervaded the entire planning process include: 1) the political nature of the planning process for a predicted disaster; 2) the difficult public relations role the USGS had to assume rather quickly; 3) the continuous presence of world media; and 4) the lack of additional funds for planning purposes.

Turning to the actual SAR response, we can only begin by pointing out an inescapable conclusion: It was a large and complex operation. At least four emergency operation centers and five different base camps were a part of the 14-day SAR operation. Six hundred square miles were searched eight to nine times over, involving 2,000 personnel from a multitude of organizations. At least 100 people were saved and 34 bodies recovered. On an individual basis, everyone we encountered was committed to aiding the victims.

Based upon both qualitative and quantitative data, it was on the organizational and interorganizational level that difficulties with the SAR response occurred. These difficulties included: 1) sub-system coordination; 2) ambiguous authority structure; 3) role conflict; 4) interface between the SAR system and the media; 5) legal authority in body recovery and 6) multiple missing persons lists. By the sixth day of the operation, however, these difficulties were confronted and successfully overcome by SAR authorities.

We then argue that the relevance of these data go beyond the Mount St. Helens eruption to other disasters which may be predicted in the future. Especially pertinent in this regard is the earthquake hazard, which has many parallels to volcanoes.

Eleven policy recommendations are made:

1. Emergency response managers must adopt an open systems perspective in both disaster planning and response.
2. The USGS should expect to assume an important public relations role in the planning process based upon a disaster prediction of a geological hazard.

3. Emergency response managers must recognize the uncertainty associated with a disaster prediction.
4. Emergency response managers must recognize the political nature of planning based upon a disaster prediction.
5. Federal disaster policy should adopt a proactive approach to disaster prediction.
6. Emergency response managers must understand the nature of emergent, multiorganizational SAR systems.
7. Emergency response managers must recognize the need for innovativeness and flexibility in emergent, multiorganizational SAR systems.
8. Emergency response managers must recognize the critical distinction between coordination and control in emergent, multiorganizational SAR systems.
9. Emergency response managers must develop a set of procedures for integrating new organizational actors into the multiorganizational SAR system.
10. Emergency reponse managers must develop a set of procedures concerning the interaction between the multiorganizational SAR system and the media.
11. Emergency response managers must develop a set of procedures for the systematic collection of information concerning dead and missing victims.

We conclude the report with a discussion of how this study contributes to a general understanding of the reality of multiorganizational systems in our society.

PREFACE

It has been over a year since the major eruption of Mount St. Helens, and much has been written about this historic event. Media coverage of this disaster has perhaps surpassed that of any other natural disaster in the history of the United States, reflecting the high level of interest that the general public has had and will continue to have as long as the volcano remains active.

Therefore, before we begin to present the results of our research, it is important to understand our approach to this case study. For, moreso than in any of our previous case studies, the Mount St. Helens SAR response involved a wide ranging set of perceptions about what occurred and why it occurred. Such differences in opinion are not unexpected in such an intense situation involving an unfamiliar and unpredictable hazard. As one of our respondents so aptly stated, "There is no textbook on how to respond to a volcano".

Given this reality, our intent here is to accurately describe the SAR response as perceived by our sample of 46 organizational representatives. When significant differences in those perceptions do appear in our data, we include them in our analysis, for they played a part in how the SAR response unfolded. We do not intend, however, to explicitly or implicitly "take up sides" and judge the rightness of one viewpoint over another. That clearly is not our role as social scientists. Rather, we take each perspective as valid and try to show how differences among them influenced the sequence of events.

Yes, there were problems with this SAR response--problems which, in hindsight, could have been avoided. But just as important are the successes

of that operation, and no one knows this fact better than the victims who were rescued from the forces of Mount St. Helens. Both successes and problems, in our view, provide an opportunity to learn. We have been fortunate in being able to explore that opportunity through constructive criticism--not destructive sensationalism as others would have it.

Ultimately, our task is to provide a useful analysis of this SAR operation so that others confronted with a similar challenge in the future can benefit from the tragic event Mount St. Helens presented on that fateful day in May, 1980. We think we have succeeded in this task. Hopefully, others will build on the lessons we all have learned and create the opportunity for more effective SAR responses following the inevitable disasters of the future. We hope you will agree.

CHAPTER I

INTRODUCTION

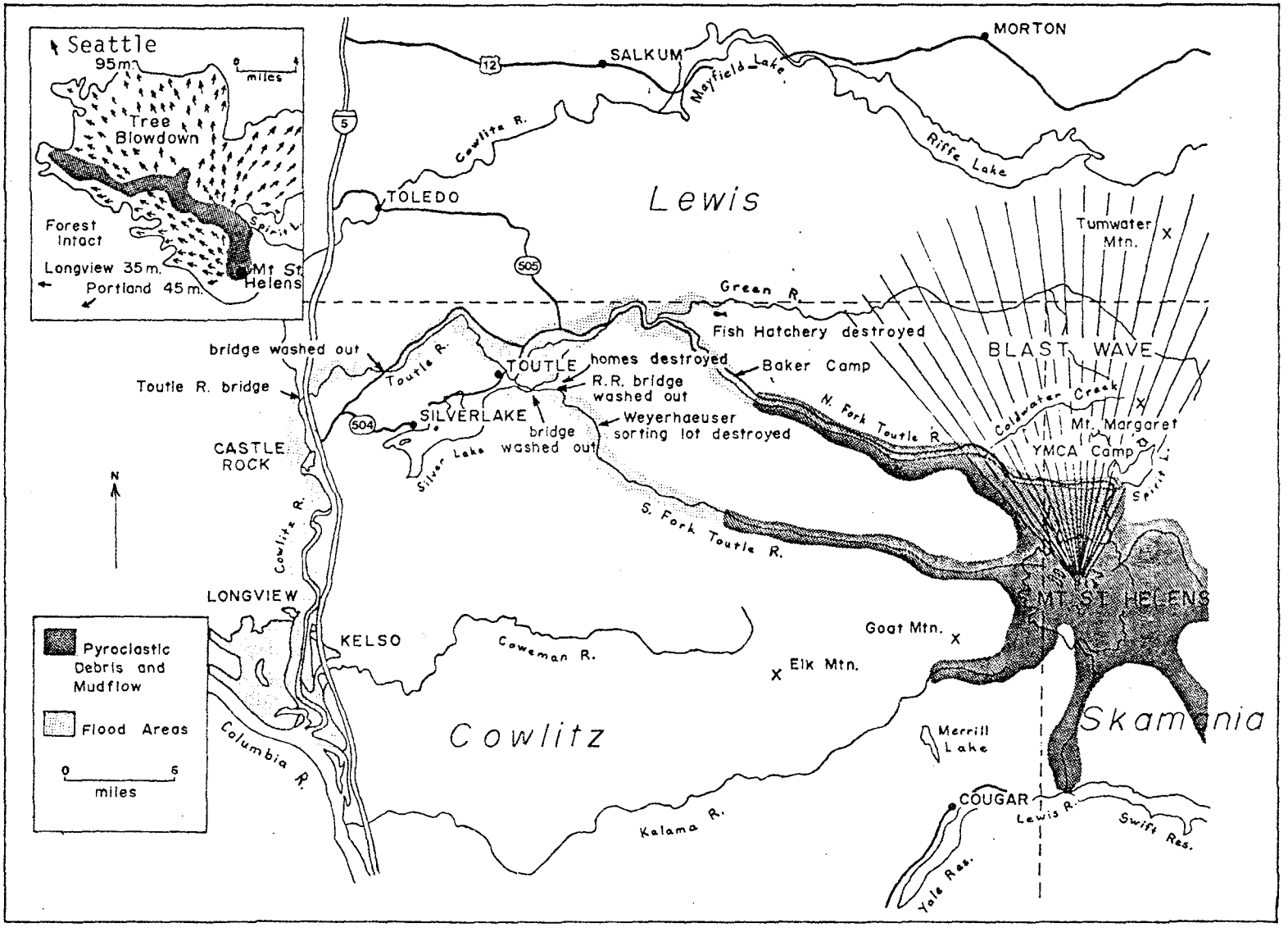
They called her "Tah-one-lat-clah", or "Fire Mountain", those Klickitat Indians of long ago. Rising 9,677 feet over the surrounding countryside of southwest Washington State, her serene beauty belied her cataclysmic past. But no longer are the Indians alone in their breathtaking awe of this violent creation of nature's forces. The world now knows of the mountain called St. Helens.

"Vancouver! Vancouver! This is it!" were the now-famous words of David A. Johnston, a geologist for the U.S. Geological Survey, as he spoke on his radio 5.5 miles north of Mount St. Helens. And it was these words that heralded a day of death and destruction. For it was 8:32 a.m., May 18, 1980, and Mount St. Helens had unleashed her fury after 123 years of geological slumber.

Seconds earlier, an earthquake measuring 5.1 on the Richter scale had rumbled underneath the volcano. More than 10,000 earthquakes had shaken the mountain during the previous eight weeks, but this one was overpowering. Without warning, countless tons of rock, glacier ice, and earth crashed down from the bulging north slope of the volcano. The avalanche slammed into Spirit Lake, sloshing millions of gallons of lake water onto lakeshore land and burying the upper part of the north fork of the Toutle River (see Figure 1). Water from displaced streams and melting ice mixed with avalanche and pyroclastic debris. Mudflows surged down both the North and South Fork Toutle River valleys, at times reaching an estimated 50 miles per hour, and destroying bridges, roadways, logging camps, trees, homes, and cars. Seconds later, the destructive force that was equivalent to several megatons of TNT blasted away the north side of the mountaintop. As shown in Figure 1, this blast wave traveled northward--not in the sudden, percussive discharge of a nuclear bomb, but in more sustained, pulsating surges of energy lasting several seconds.

FIGURE 1

MOUNT ST. HELENS IMPACT AREAS*



*Adapted from pages 42-43 (Sherman) in Volcano, The Eruption of Mount St. Helens, The Daily News and The Journal-American. Longview, Washington: Longview Publishing Company.

Following this initial shock wave was a steam-powered air mass of pulverized rock, soil, and forest debris. Moving northward with the unbelievable force of a 300-mile-per-hour hurricane, this "stone wind" showed no respect for what stood in its way. Everything in its path--156 square miles of beautiful high country--was devastated. And yes--in its deadly path were people.

The awesome wall of destruction in the North Fork of the River finally stopped 17 miles west of the mountain. Flash flooding and mudflows in several stream courses, however, extended the wrecking devastation. A mud-filled torrent continued the swift westward path into the Toutle River, and beyond into the Cowlitz and Columbia Rivers. An estimated 50,000 cut logs were picked up at Camp Baker, mingling with whole trees, and parts of bridges and roadways, and 90·F mud to create a mammoth mass of ravaging proportions. The Toutle River swelled to nearly three times its normal size, wiping out the homes that stood along its once picturesque banks. And, yes, more than 1,000 people were in its deadly path--not to mention 50,000 people living along the banks of the Cowlitz River in the cities of Castle Rock, Kelso, and Longview.

And then there was the ash. A towering cloud of finely pulverized rock dust, and volcanic glass rose 63,000 feet above the volcano. Prevailing winds took the gray gloom in an east and northeasterly direction, showering the eastern part of the state and creating havoc for the unprepared populace. The surrounding countryside soon turned a dullish gray as the ash fell from the darkened skies. And again, thousands of people now faced an unfamiliar and unexpected hazard.

The next day, the threat of even more destruction was ever-present. Geologists feared that an avalanche-debris dam holding back the new Spirit Lake would not last much longer. If the 200-foot-high plug broke, an estimated

80 billion gallons of muddy water would once again roar down the Toutle and Cowlitz rivers. Although it did not break, this impending threat was very real for those people living along the riverbanks.

All of the impacts of this one disaster--the worst natural disaster in Washington State history--are still undetermined.* Perhaps they never will be fully realized. We do know that 61 people have been listed as dead or missing and presumed dead as a result of the May 18 eruption.** But we also know that at least another hundred may have been added to this list if it were not for the actions of a multitude of emergency response organizations. Hundreds more were evacuated from the banks of the deadly rivers. And in the eastern part of the state, an untold number of stranded motorists were rescued from the ash-covered highways.

It is these search and rescue (SAR) responses which this report is all about. For on that fateful day in May, Mount St. Helens had an unprecedented impact upon the local communities surrounding her slopes, the state of Washington, and the entire country as well. This combination lateral blast, ash eruption, and flash flooding created a set of unique and inordinate demands--demands which necessitated a response far beyond the more typical natural disaster. Hundreds of individuals, groups, and organizations rose to the challenge that the forces of nature had presented in such an awesome manner. And amid the multitude of activities emerged a large and complex multiorganizational SAR system. It was this system which provided the framework, the "backbone", the "organizing" of activities which led directly to the saving of lives.

This report is the last in a series of six case studies on SAR

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*Please refer to U.S. Senate Hearings, 1980, and Hunt and MacCready, 1980, for estimates of economic losses.

**This figure was taken from The Oregonian, 1980. The figure of 60 deaths is the official record of the Cowlitz County Sheriff's Department as of April, 1981.

responses to natural disasters.* In the following pages, we will trace the emergence of this multiorganizational SAR system, based upon a rich source of data collected during the weeks following the May 18, 1980 eruption of Mount St. Helens.** Following this introductory chapter, which presents our conceptual and methodological approaches to this case study, the next chapters describe: 1) the Washington State SAR Community: 2) prior planning activities for a Mount St. Helens eruption; 3) the SAR response to the May 18, 1980 eruption; and 4) the emergent multiorganizational SAR system. We conclude our report with a discussion of the major research findings, their implications for public policy, and theoretical insights on organizational behavior.

An Overview of Past Research

Despite the extensive physical, social, and economic losses following natural disasters, there is little debate that the most distressing consequence is the loss of lives.*** Disaster stricken communities quickly rebuild houses, schools, and factories (Haas, et al., 1977); yet, it is the deaths of family members, neighbors, relatives, or friends that create far more lasting disruptions (Wolfenstein, 1957; Erikson, 1976). Not too surprisingly, therefore, the search for and rescuing of victims is the predominant concern of individuals and organizations during the immediate aftermath of a disaster (Fritz and Williams, 1957; Form and Nosow, 1958; Drabek, 1968; Quarantelli and Dynes, 1972; Mileti, et al., 1975). How effective these SAR activities

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*This research is but one part of a larger research project which examined SAR activities following six natural disasters and one remote setting study in five different states. Please refer to the back page for a listing of the Technical Reports on each of these case studies.

**I wish to acknowledge the assistance received from the other members of the SAR Project staff, especially Thomas E. Drabek, Christopher R. Adams, and JoAnne Quayle, who completed many of the interviews; and Lori Battle, who typed the manuscript.

***For annual losses of various types for a wide range of natural disasters, including tornadoes, hurricanes, floods, earthquakes, and the like, see White and Haas, 1975.

are can have life-and-death consequences, especially when the disaster strikes unexpectedly or with little forewarning (Wenger and Parr, 1969).

Although its importance is obvious, there is a lack of comprehensive, empirical research on SAR. There are a number of documents which describe how SAR missions ought to occur (e.g. Erven, 1970; DCPA, 1972; Lewis, 1972; Stoffel, 1976; LaValla and Wade, 1976; NASAR, 1978), but most of these have focused on SAR missions in remote areas rather than disaster settings. And too, there is a host of emergency preparedness publications aimed at preventing the need for SAR (Bridge, 1973; NOAA, 1975; USFS AND USSA 1976; NASAR, 1978; Stoffel and LaValla, 1980; Fear, 1975). Finally, the analysis of victim behavior has been a major concern among SAR practioners (Kelley, 1973; Syrotuck, 1973; Robins, 1977; NASAR, 1978).

Each of these topics are important and deserve the attention of both practitioners and researchers. Yet, none of them describe what actually goes on during a SAR response to a natural disaster. Limited observations have been make in the context of a larger case study of a particular disaster (e.g., Marks, 1954; Wallace 1956; Form and Nosow, 1958; Anderson, 1968; Drabek, 1968; Kennedy, 1969; Wenger and Parr, 1969; Haas and Ayre, 1969; Committee on the Alaska Earthquake, 1970; Taylor, Zurcher, and Key, 1970); these activities, however, received only brief attention. In short, we have not been able to identify a single published comparative study wherein SAR actions were the primary research focus.

We do have some general insights, based upon previous research, into the circumstances in which SAR responses to natural disasters occur. When a relatively sudden and large-scale disaster strikes a community, normal patterns of activities are disrupted as community members learn to respond to new types of demands--demands that usually are unexpected and unfamiliar.

Typically, these responses involve a variety of interactions among a multitude of individuals, groups, and organizations (Dynes, 1970; Mileti, et al., 1975). A "therapeutic community" thus emerges to provide a large volume of essential services quickly (Barton, 1969).

The most immediate and critical demand placed upon this emergency social system is the search for and rescuing of victims. The SAR response, however, can be problematic for a number of reasons (Wenger and Parr, 1969). First, it occurs early in the time sequence of the post-disaster response. Second, it involves a threat to human lives, so that there is a sense of urgency present which mitigates against a rational organization of activities. Third, it can tend to be somewhat haphazard and nonsystematic. And fourth, SAR usually is not considered to be the major responsibility of any existing community agency.

Nevertheless, when confronted with a large-scale disaster, a community will pull its resources together in order to meet the multitude of needs of those impacted by nature's forces. There is some evidence which suggests that much of the immediate response is made by "unofficial helpers"--persons who lack formal affiliation with an emergency organization (Marks, 1954; Form and Nosow, 1958; Fritz, 1961a, 1961b). Yet, the extent and types of assistance given by these "good samaritans" remains undocumented (Dynes and Quarantelli, 1977). So too is the role of "emergent groups" (Forrest, 1974, 1978), which may play a significant role in post-disaster responses.

More systematic SAR procedures are introduced once representatives of various emergency organizations arrive at the impact area. At the heart of this process is the emergence of unplanned interorganizational patterns of interaction (Dynes, 1970, 1978; Weller, 1972; Haas and Drabek, 1973; Turner,

1976), since no one agency can meet all of the SAR-related demands (Kreps, 1978). The analysis of the 1964 Alaskan earthquake (Committee on the Alaska Earthquake, 1970) represents the best chronology of the emergence and organization of SAR activity. Yet, even here, these critical interorganizational processes receive minimal attention.

In sum, our knowledge base is meager regarding both descriptions of SAR responses following natural disasters and the factors which might account for any variations in these responses. While some insights are available, they provide few guidelines for emergency managers to plan effective post-disaster SAR responses. And too, researchers are hard-pressed to formulate research with much rigor when the knowledge base is so minimal. Hence, we sought to design a research project whereby the knowledge gained about SAR activities would benefit both the SAR practitioner as well as the disaster researcher.*

Research Objectives

The primary focus of this case study was to document the SAR response to the May 18, 1980, eruption of Mount St. Helens in a systematic and comprehensive manner. We have translated this general goal into four more specific objectives:

1. To describe both the pre- and post- disaster actions of a variety of organizations most involved in the SAR operation.
2. To measure the critical interorganizational processes which occurred among these organizations during the SAR response.
3. To obtain the perceptions of organizational managers concerning "lessons learned" during this SAR operation. Views about accom-

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*A summary monograph (Drabek et al., 1981) presents the results of a comparative analysis of all six disaster case studies of our research project plus contrasts to and exploration of certain aspects of remote area SAR activites.

plishments, problems, and possible solutions can be useful to other organizations which may confront future SAR responses of comparable magnitude and complexity.

4. To explore the role of "unofficial helpers"--that is, family members, friends, neighbors, and so on, who became involved in the SAR response, but were not associated with an emergency organization which responded to the Mount St. Helens eruption.

Our Conceptual Framework

Given the complexity of a SAR response to a natural disaster, which was especially true for Mount St. Helens, we as social scientists did not go into the field without some prior planning--what we call a conceptual framework. A conceptual framework consists of a set of concepts which, taken together, provide us with an overall perspective on the social reality we want to investigate. As opposed to the various journalistic accounts of the Mount St. Helens eruption, we wanted to gather the information in as systematic and comprehensive manner as possible. With a conceptual framework, we were more likely to collect the data in such a manner.

Our conceptual framework is based upon an open systems perspective (Buckley, 1967; Katz and Kahn, 1978) using an interorganizational level of analysis (Negandi, 1975; Aldrich, 1975; Kilijanek, 1980). That is, instead of viewing a SAR response as comprised of a multitude of individuals, we have found it more productive to conceptualize it as a set of organizations involved in the pursuit of a common goal--search and rescue. These organizations, however, do not exist in a vacuum, but are tied together by interorganizational relations. These relations consist of different kinds of linkages between two or more organizations. We have chosen six types of linkages as the most critical in a SAR operation--mobilization, communication, deci-

sion-making, control, coordination, and conflict linkages. Capturing these processes would provide us with the essential compenents of the SAR operation.

The total sum of all interorganizational linkages among all organizations involved in the SAR response is defined as a multiorganizational SAR system. Such a system emerges over time in response to a set of SAR demands (i.e., inputs). It also does not exist in a vacuum (i.e., it is an open system), but rather is embedded in an external environment which directly impinges upon its internal structures and processes. This external environment includes the public-at-large as well as specific audiences, such as the media, the scientific community, other emergency response agencies, and the family, relatives, and friends of the disaster victims. Thus, not only does this multiorganizational SAR system have to negotiate its internal make-up, it also must direct considerable attention to its external mileau at the same time. The extent to which both of these tasks are successfully accomplished determines the effectiveness of the overall system. As we shall see in the following chapters, both of these tasks proved to be problematic in the Mount St. Helens SAR response.

Finally, we have conceptualized this multiorganizational SAR system as emergent over time. Rather than portraying it as a static social reality, it is more accurate to capture the processes of emergence and change as they occurred from one day to the next. Organizations may enter the system and leave it at different times. SAR demands, roles, and tasks may change. Interorganizational linkages may become established at different points in the SAR response. Thus, although it requires a more complicated research strategy, measuring the emergent process provides us with a more precise picture of the complexity of the SAR response. Let's take a close look at that research strategy.

4,000 Miles of Fieldwork

With the May 18, 1980, eruption of Mount St. Helens, we knew that a unique research opportunity was before us. Although our original data collection plans of documenting SAR responses to five disasters had been completed, we decided to add Mount St. Helens as a sixth case study. This decision was made for three basic reasons: 1) such a unique and spectacular disaster would serve as an added contrast to the three tornadoes, the flash flood, and the hurricane we had already investigated; 2) the case study on the Mount St. Helens SAR response would greatly enhance the data already collected during the past two and one-half years on a statewide assessment of the SAR Community in Washington State (see Technical Report #6); and 3) such an event, like the 1964 Alaskan earthquake (Committee on the Alaska Earthquake, 1970), would provide a wealth of information for planning the response to future disasters of the same or even greater magnitude and complexity, e.g., other volcanoes, earthquakes, or nuclear accidents. Thus, with limited funding from the National Science Foundation, we once again initiated our fieldwork procedures.

On June 3, just two days after the SAR operation ended, Kilijanek left on a reconnaissance trip to Washington State. Once there, he made contact with managers of key agencies involved in the SAR response. Gaining access to these officials--as well as all of the organizational representatives we interviewed--proved to be less problematic than what would be expected, given the fact that they were still involved in post-disaster emergency operations. This was to a large extent due to the rapport established with SAR representatives during previous data collection efforts over the past two and one-half years.

From the information gathered on this initial reconnaissance trip, we made a number of decisions. We discovered that documenting all of the SAR activities that occurred in response to Mount St. Helens was well beyond our limited resources. So we decided to concentrate our efforts on the major SAR response immediately around the mountain. As seen in Figure 1, this response involved Cowlitz, Lewis, and Skamania Counties.

Second, we would try to obtain a limited set of data on the SAR activities in the Moses Lake-Ritzville area, which received a substantial ash fallout. The nature of the response to such a unique hazard is relatively unknown (Warrick, 1975). In addition, describing some of these activities in the eastern part of the state gives a more balanced assessment of the total impact that the volcano had on the entire state of Washington.

Third, a sample of 27 organizations was developed with the input of knowledgeable informants. As seen in Figure 2, this sample represents a wide variety of local, state, and federal agencies that were heavily involved in the SAR response.* Although some of these listed organizations are actually units of the same agency, e.g., three from the US Forest Service, three from the US Army, and so on, we surmised that their responses were relatively independent of each other. Thus, it made more sense to treat them as separate organizations for purposes of this research effort.

Fourth, we discovered that the nature of the volcano's impact precluded, to a great extent, the involvement of "unofficial helpers". Getting anywhere near the mountain on foot was almost impossible. Thus, unlike other case studies of this research project (see Technical Reports #2, #4, #5), SAR activities almost exclusively involved organizational personnel. We therefore

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*Not shown in Figure 2 is the 303rd Air Rescue Group that responded from March Air Force Base, California.

did not make any further efforts to obtain a sample of "unofficial helpers" for this case study.

And fifth, we considered it imperative to coordinate our fieldwork with other research teams which may be interviewing the same individuals we had in our sample. We had discovered in our earlier fieldwork for the Wichita Falls tornado that such coordination proved to be mutually beneficial to both the various organizational representatives as well as the researchers. Contact was therefore made with the National Science Foundation; the Technical Information Network of the Federal Emergency Management Agency in Vancouver, Washington; the Natural Hazards Information Center in Boulder, Colorado; Dr. Ron Perry and his associates at Battelle Institute in Seattle, Washington; Dr. Tom Saarinen, Department of Geography, University of Arizona; and Dr. John Sorensen, Oak Ridge National Laboratories. Each of these contacts provided us with an opportunity to exchange information regarding research purposes and procedures, thus avoiding a duplication of efforts and an "over-interviewing" of officials. In our view, these efforts proved to be most helpful.*

With interview schedules and questionnaires in hand, a team of three interviewers arrived in Washington State in mid-June for three weeks of fieldwork. Extensive interviews--some lasting three hours or more--were conducted with 37 representatives from the 27 organizations in our primary sample. The person or persons viewed as directing each organization's response was interviewed.

Another nine non-structured interviews were conducted in the Moses Lake-Ritzville area. These included the Moses Lake Police, Fire, and Parks departments; Adams County Sheriff's, Public Works, and District 1 Fire

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*One result of such cooperation was the Mount St. Helens Scientific Workshop, held in Washington, D. C. November 13-14, 1980, and jointly sponsored by the National Science Foundation and the Federal Emergency Management Agency (see Kerr, 1980, 1981).

departments; Grant County Sheriff's Department; Ritzville Fire Department; and the Washington State Patrol.

Sources and Types of Data

The data collection process involved gathering both qualitative and quantitative data from four primary sources. First, an interview schedule containing both fixed-choice and open-ended questions was followed during the interview with each organizational representative. In addition to other relevant data concerning the role of the organization in the SAR response to the disaster, the interview schedule was designed to capture various types of interorganizational linkages, e.g., mobilization, communication, coordination, decision-making, control, and conflict, as they emerged during each of three time periods: 1) Sunday and Monday, May 18 and 19; 2) Tuesday through Friday, May 20 to 23; and 3) the last nine days of the SAR response, May 24 to June 1. These divisions were based upon initial information received from key organizational officials concerning the sequence of events in the SAR operation. The interview schedule also contained questions concerning general, routine interactions with other organizations in the sample during the year prior to the May 18 eruption of Mount St. Helens.

As part of the interview process, the interviewer took additional notes on the step-by-step sequence of events of the organization's SAR response. These notes were then recorded on cassettes and transcribed for examination. Such complementary data are important in gaining a gestalt of the disaster response not possible through the more structured interview items. Although the data are retrospective, all interviews were conducted in less than two months after the May 18 eruption, allowing for more accurate recall. In addition, the disaster was such an intense experience for the respondents (Erikson, 1976) that they had little trouble recalling the sequence of events

during each of the three time periods. The same was true for questions on the pre-disaster, routine interactions with other organizations. At the same time, retrospective reports can be subject to some degree of distortion.

Second, a questionnaire containing 88 additional questions on organizational characteristics was left with a respondent from each organization who was asked to fill it out during the following days and mail it back to the University.

Third, additional data relevant to SAR activity were collected whenever possible. Each organizational representative interviewed was routinely asked for copies of any records, documents. communications tapes, and reports concerning the disaster. These were carefully examined for relevant information.

Finally, newspapers, magazines, special editions, and radio broadcasts provided us with yet another source of information.*

Using this wealth of data, five types were generated which, taken together, have provided a comprehensive description of the organizational and multi-organizational responses to the SAR demands of the Mount St. Helens disaster. These five types of data are:

1. Prior Community SAR Capabilities. Limited data were collected from organizational respondents regarding their SAR capabilities, including prior plans, exercises and training experiences, and relevant resources. In addition, key interorganizational processes such as communication, coordination, and conflict were measured. The question we sought to address is: What were the SAR capabilities of the community prior to the eruption?

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*We would like to thank Dr. Ron Perry and his colleagues at Battelle Institute, Seattle, Washington, for their much appreciated assistance in the collection of data from various media sources. These sources include: The Seattle Post-Intelligence, The Daily News (Longview), The Journal American, (Belleview), The Columbian (Vancouver), The Oregon Journal, and The Seattle Times.

2. SAR Demands Generated by the Disaster. Descriptive data regarding relevant characteristics of the disaster event were collected, e.g., the number of dead and injured, scope of the damaged area, and length of forewarning, in order to assess the specific tasks generated. With these data, we sought to answer the question: What were the SAR related demands generated by the eruption?
3. SAR Response: Organizations. Data were collected on the involvement of each sampled organization in the SAR response. Together with a detailed descriptive account of each organization's response, these data include many specific items such as resources utilized, number of personnel, SAR role, and the like. Thus, we were interested in addressing the question: What was the organizational SAR response to the eruption?
4. SAR Response: Multiorganizational System. We also gathered data on characteristics of the emergent multiorganizational system which is defined as the total sum of interactions among all of the organizations in our sample. Such data captured critical interorganizational processes such as mobilization, communication, control, decision-making, coordination, and conflict. In addition, each of these processes were assessed as they emerged across time, i.e., the first two days (Time Period 1); the next four days (Time Period 2); and the remaining nine days of the SAR operation (Time Period 3). The question which we sought to answer with these data is: What interorganizational patterns emerged during the SAR response to the eruption?

5. Operational Problems and Observations. From each respondent, we gathered data on their perspectives of "lessons learned" pertaining to the SAR response. Specific attention was given to problems within and among organizations, recommendations to future participants in SAR responses, and anticipated changes as a result of the SAR experience (see Table 1 for a summary of the types of data, guiding questions, and data sources).

Although we view the research design as providing the most comprehensive and systematic information available on a SAR response to a natural disaster, its strengths and limitations should be considered in weighing the results of the study. Such methodological strengths include the rapid initiation of field procedures; the high response rate of our samples; the combination of qualitative and quantitative data; the use of different informants in providing multiple perspectives; and the use of three separate time periods so as to capture--at least crudely--the temporal dimension of the dynamic emergence of the multiorganizational system.

On the other hand, unavoidable limitations of the research reflect the difficulty in implementing many aspects of ideal research in post-disaster situations. These included the lack of random samples; the reliance on perceptions of no more than four managers regarding the behavior of their entire organization; and the difficulty in generalizing to other SAR responses. Nevertheless, given the phenomena under study and the research objectives, such limitations do not seriously weaken this case study nor invalidate its results.

TABLE 1

SUMMARY OF DATA COLLECTION

Types of Data	Key Questions	Data Sources
1. Prior Community SAR Capabilities	What were the SAR capabilities of the community prior to the eruption?	Interview and Questionnaire Organizational Officials
2. SAR Demands Generated by the Disaster	What were the SAR-related demands generated by the eruption?	Interviews--Organizational Officials, Organizational Records, Documents, Mass Media
3. SAR Response: Organizations	What was the organizational SAR response to the eruption?	Interview and Questionnaire Organizational Officials
4. SAR Response: Multiorganizational Network	What interorganizational patterns emerged as a result of the SAR response to the eruption?	Interview and Questionnaire Organizational Officials
5. Operational Problems and Observations	What problems were encountered?	Interview--Organizational Officials
	What recommendations to future participants of SAR responses were made?	
	What changes were anticipated as a result of the SAR experience?	Organizational Records, Documents, Mass Media

CHAPTER II

THE WASHINGTON STATE SAR COMMUNITY

Prior to any indications that Mount St. Helens was going to display her awesome fury to the world once again, we had been collecting a wealth of data on search and rescue (SAR) in the state of Washington. Among the primary objectives of the overall research project, we wanted to document SAR activities on a statewide basis--that is, just how does SAR get done in a given state? What organizations are involved on a routine basis? What roles do they play? How often do SAR missions occur in a given year? These and other questions had never been addressed in a systematic manner.

Among the many states with a significant amount of SAR activity, we chose Washington State as one of our research sites* for three basic reasons: 1) its efforts at statewide coordination of SAR has been acknowledged by members of NASAR (National Association for Search and Rescue) as one of the most advanced in the country; 2) initial contacts with key members of the SAR Community in the state indicated that we would receive the necessary cooperation of the SAR authorities from local, state, and federal agencies; and 3) the existence and availability of records, documents, and data bases on the SAR activities of various organizations in the state was confirmed.

Beginning in January, 1978, and continuing through June, 1979, we personally interviewed about 60 representatives in the Washington State SAR Community, had mailed questionnaires completed by another 142 organizational leaders, and gathered numerous reports, documents, newspaper articles, and

*We have also collected similar data in the state of Wyoming--which is not as formally developed as Washington--to provide a comparative picture of the two states. See back page for the full listing of Technical Report #10 on this second state case study.

organizational records. Using these data sources, a systematic and comprehensive assessment of the Washington State SAR Community was written by the author of the present report.*

This chapter presents some of the insights gained from what is, in effect, a pre-disaster analysis of SAR activities in the state of Washington. Here, we are able to provide a context in which to more fully understand the SAR response to Mount St. Helens. For the nature of that response is not ahistorical, but rather reflects characteristics of the SAR Community as they existed prior to May 18, 1980 (Baker and Chapman 1962; Anderson, 1969; Dynes, 1970; Kreps, 1978).

In this chapter, we will describe how this SAR Community responds to more typical SAR demands on a daily basis. Then, returning to the Mount St. Helens disaster and its aftermath in the next chapter, we will be able to compare these more routine SAR activities with the much larger and more complex response following the May 18, 1980 eruption.

A Variety of Roles

Just who does respond to SAR demands in the state of Washington? We have discovered that SAR activities involve a diverse mixture of local, state, and federal organizations which together provide the resources necessary for the saving of lives on a daily basis. Let us take a close look at the variety of roles routinely played by some of the main SAR agencies which responded to the Mount St. Helens eruption.

Search and rescue** in the state of Washington almost always begins with the county sheriff's department. As the chief law enforcement officer in each

*A more in-depth analysis of the data presented in this chapter can be found in Technical Report #6, entitled "To the Rescue: The Search and Rescue Community in the State of Washington" by Thomas S. Kilijanek (see last page of this report).

**For purposes of this research, we are using the term "search and rescue to refer to those responses wherein the victim is located somewhere in a remote setting--in general, a rural recreational area such as a National Park, National Forest, or state park. Thus, routine emergency responses which occur on a daily basis in communities across the country are excluded--fires, traffic accidents, and all criminally-related activities.

of the 39 counties in the state, the county sheriff is legally responsible for the health and welfare of the citizens within his jurisdiction. Historically, this general role was interpreted to include SAR activities, although this has been questioned from time to time by some county officials. More recently, the legal ambiguity has been eliminated with the signing of State House Bill 527 in April, 1979. It states:

> The chief law enforcement officer of each political subdivision shall be responsible for local search and rescue activities. (Section 4, Chapter 38.52, Revised Code of Washington)

Given this authority role, the county sheriff's department usually begins the mission and directs the various local, state, and federal resources which may be called upon to assist. In many cases, the mission coordinator is a deputy who has specialized in SAR and acts under the sheriff's authority.

The second major governmental agency involved with SAR on the local level is the county or city Department of Emergency Services (DES). The role of these agencies is also written into state law (Section 4; Chapter 38.52, Revised Code of Washington):

> The local emergency services director shall notify the state department of emergency services of all search and rescue missions. The local director of emergency services shall work in a coordinating capacity directly supporting all search and rescue activities in that political subdivision.

Thus, we have a distinction between the authority role of the county sheriff's department and the coordinating role of the local DES. Due to perceived difficulties with this distinction, however, there has been a recent trend in the state to place DES responsibilities within the sheriff's department, e.g., the Skamania County Sheriff is also the DES director.*

Other DES responsibilities are in the area of disaster planning. Written

*As of 1980, over 50% of the state's counties have placed the DES function within the sheriff's department (personal correspondence with Rick LaValla, State Department of Emergency Services).

disaster plans, training sessions, and simulated exercises wherein local emergency response organizations participate are all a part of preparing a community for both the remote setting SAR mission and the response to large-scale natural disasters.

Working under the direction of the county sheriff's department and/or the County DES is a wide variety of volunteer organizations which provide the bulk of resources for SAR activities in the state. A total of 246 such groups have been identified in our data collection efforts, the majority of which are located in the more mountainous area of western Washington State. They include Explorer Search and Rescue units; the Civil Air Patrol; Mountain Rescue Councils; search and rescue dog units; the Ski Patrol; four-by-four jeep units; diving teams; snowmobile units; communications services; SAR Councils; Red Cross and Salvation Army chapters; sheriff posses, reserves, and cadets; some volunteer fire departments, cave rescue units, and a number of groups specifically organized for SAR missions, e.g., Salkum SAR.

On the state level, it is the State Department of Emergency Services (DES) which plays the primary coordinating role between local and state and federal SAR resources. The State DES supports the local SAR effort in three main ways. First, all extra-local resources, including those from other counties, other state agencies, other states, and military organizations, are activated through the State DES. If a SAR coordinator decides that resources outside of his countyare needed for a particular mission, he contacts the duty officer at the State DES in Olympia who then activates the formally recognized linkages to the organization or organizations which can provide these resources. The most frequent request is for military helicopters, since the cost of this type of resource is prohibitive for most counties.

Second, state funds are distributed through the State DES for extraordinary costs during a SAR mission, including liability coverage for all volunteers (Section 5, Chapter 38.52, Revised Code of Washington). And third, the State DES provides training and technical assistance to local SAR organizations and serves as the primary data collection agency for SAR activities throughout the state.

Another important state agency is the Washington State Aeronautics Commission. It has the statutory authority to conduct air searches for non-commercial and non-military aircraft overdue, missing, or presumed down. This authority is augmented by a memorandum of understanding between the Air Force and the state of Washington which enables the Aeronautics Commission to open, conduct, and direct searches, use available military equipment, and suspend or close searches for aircraft. Once an aircraft is located on the ground, however, all further SAR actions which are necessary are under the authority of the appropriate county sheriff. The Commission then acts as a support agency to the local county sheriff's department if additional air support is necessary. *

A variety of state military resources are available from both the Air and Army National Guard. These units are available for both ground and air support of routine SAR missions at the request of the State DES. In state emergencies, such as natural disasters, the governor can authorize the National Guard to respond if needed. This support includes transportation, communications, messing facilities, refueling , supplies, temporary housing, first aid, and direct air and ground SAR capabilities. To a great extent, normal military preparedness provides the type of training necessary to carry out these activities.

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*For an extended and up-to-date discussion of air SAR, see Stoffel and LaValla, 1980.

And then there is the State Highway Patrol which is infrequently involved in SAR activities. Its primary role is to respond to highway traffic accidents and in general maintain safety on the state highway system. On occasion, however, a county sheriff may request the patrol's assistance in a SAR mission.

To complete our brief overview of SAR organizations, we now turn to federal level agencies. Most of these are military organizations which participate in civilian SAR efforts if such activities do not interfere with their military objectives. At the request of the State DES, Army, Navy, and Air Force resources--usually helicopters to provide emergency transportation--are tasked to a particular mission under the direction of the county sheriff. This request is routinely channeled through the Air Force Rescue Coordination Center at Scott Air Force Base, Illinois (near St. Louis, Missouri) which must give its formal approval for any military resources to be used. Usually, the mission must involve a life or death or possible loss of limb situation wherein the victim has already been located. Participation in post-disaster responses is also possible, especially if it is a federally-declared disaster.*

The U.S. Coast Guard also gets involved in SAR missions, given their responsibility for all instances wherein an individual is in a state of duress on the ocean and all navigable waterways.

Our last federal agency which had a significant part in the Mount St. Helens SAR response is the US Forest Service. The role of the Forest Service (USFS) in SAR activities is usually minimal. Many times they are first on the scene of a SAR incident within the USFS land and will take any immediate actions necessary. At the same time, the local county sheriff's department

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*In such cases, the lead federal coordinating agency is the Federal Emergency Management Agency (FEMA).

will be contacted which will take charge of the mission once the sheriff or his deputy arrives on the scene. Forest Service personnel will then provide backup support to the sheriff's department if requested.

So, there you have it--the major actors in SAR on the local, state, and federal levels that responded to the Mount St. Helens disaster. As evident in these brief descriptions, these varied and specialized SAR organizations rarely act alone. Search and rescue is routinely a multiorganizational enterprise, the essence of which is interorganizational relations.

A System of Interorganizational Linkages

You can take the best SAR organizations in the country, put them all in the same mission, and watch them fail miserably if one ingredient is missing--interorganizational relations. It is the "glue" which turns a group of independent, specialized SAR organizations into a well-oiled mulitorganizational system. It is the key to successful SAR management.

Why? Because it is a fact that no one organization has the resources to meet all of the SAR demands in even one county and, certainly, even one disaster. Therefore, the planning, establishment, and maintenance of interorganizational relations is just as important as having enough walkie-talkies or a fully-equipped base station. Having the right resources is only half the battle--the other half is making sure the right resources are available at the right time, the right place, from the right organization. It is quite a job--and it can only be done through successful interorganizational relations.

One reason why the state of Washington is considered ahead of many other states in SAR is the existence of a statewide system of resource coordination. That is, if a county sheriff needs a particular resource, there is an interorganizational system established for the specific purpose of making sure that resource gets to him quickly. And what does this system look like? Take a

look at Figure 3.

Here we have a "social" map of the SAR Community in the state of Washington. It represents the formal resource linkages utilized for SAR missions among the key SAR organizations in the state. By formal linkages, we mean the officially recognized interorganizational channels which have been established by written mutual aid agreements, organizational charters, military regulations, and state laws. Frequently, informal interorganizational linkages are developed by two or more SAR organizations in the course of working with each other which initially bypass these formal channels. This is done to assure a quicker response by an organization with a needed resource. It is only later that official channels are used to secure the necessary approval. As we shall see later, such informal linkages did play a part in the Mount St. Helens SAR response. Our concern here, however, is with the formal linkages only.

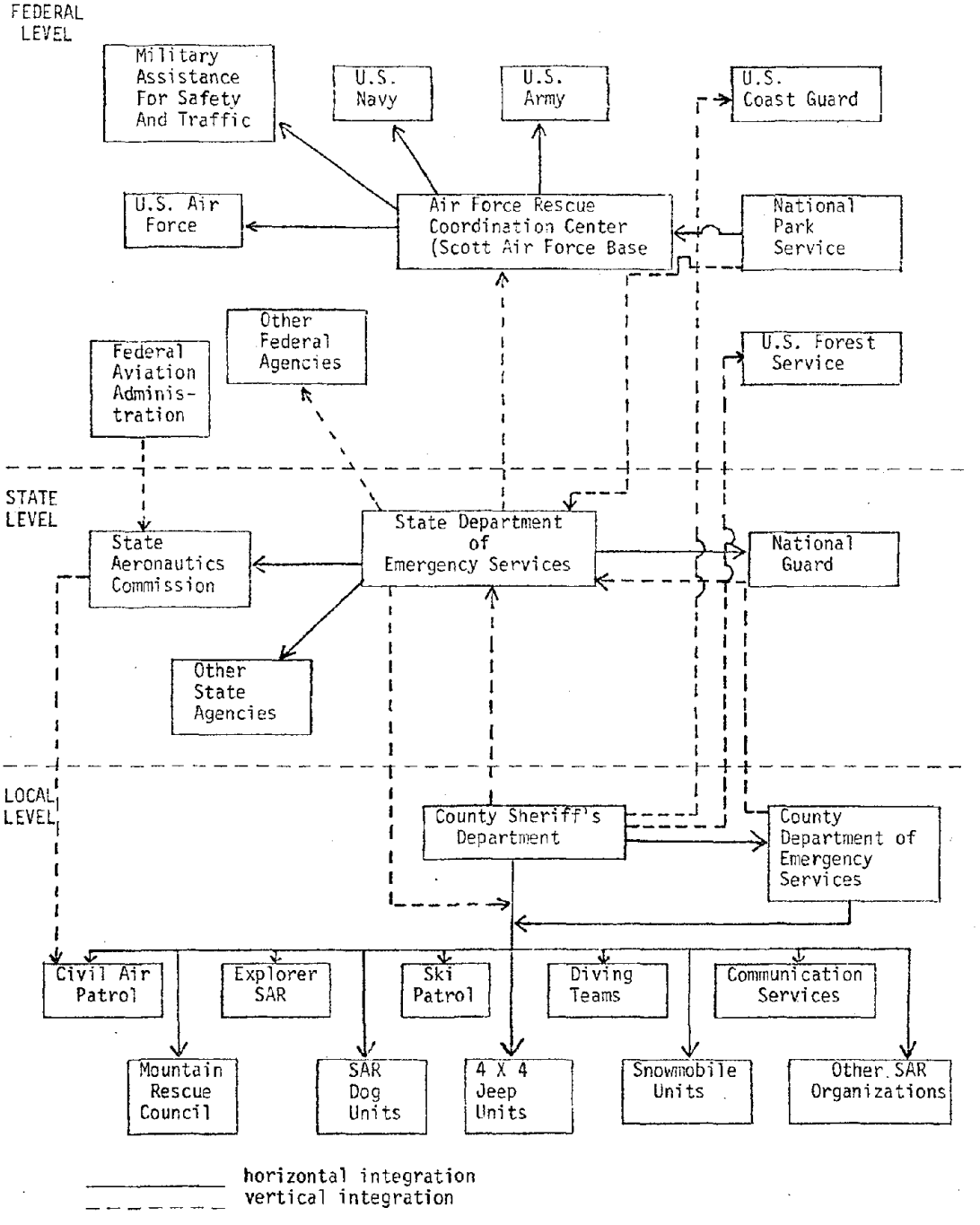
So let us take a close look at Figure 3. One important characteristic of this social map is the central locations of the county sheriff's department, the State DES, and the Air Force Rescue Coordination Center (AFRCC). They literally "tie together" the different types of SAR resources into one overall system.

These three linking-pin organizations serve to integrate the interorganizational system in two ways. First, there is horizontal integration. Each of these agencies are in a different governmental level and serves to link together the other SAR organizations within that level. Thus, the county sheriff's department has the central role on the local level in mobilizing the local volunteer organizations and establishing a multiorganizational system for a particular SAR mission. In some counties, the county DES and the County SAR Council assist in this linking together process. Likewise, the State DES

FIGURE 3

STATE OF WASHINGTON

A SOCIAL MAP OF THE SAR COMMUNITY*



*This "social map" is based upon data collected during 1978-1979 from interviews with key informants in each type of organization. It represents the formal resource linkages utilized for SAR missions in the State of Washington

provides linkages to other state agencies and the AFRCC plays the central role on the federal level.

Second, there is vertical integration. That is, these three central organizations link the local, state, and federal levels together to create one overall system within the state. It is the county sheriff's department (and, in some counties, the county DES) which goes to the State DES for most extra-local, i.e., other county, state, and federal resources. And it is the State DES which uses its linkages to the AFRCC for federal resources and to other counties for their local volunteer resources.

As one can see, it is the State DES which provides the crucial mechanism for the vertical integration of the SAR Community. Without an agency to play this central role, coordinating the resources from the local to the state and federal levels would be more problematic. Each of the county sheriff's departments would be forced to establish linkages with the various extra-local organizations independently. Likewise, instead of just one central agency to deal with, each state and federal organization would have to contend with 39 sheriff's departments.

There are exceptions to the main vertical resource linkages described above, reflecting the various legal authorities for SAR activities. For example, a County Sheriff's Department can contact the U.S. Forest Service directly without going through the State DES if the mission is on federal forest lands. This is also true for U.S. Coast Guard involvement in a mission on a navigable waterway. For missing airplanes, the State Aeronautics Commission is in charge and has a direct linkage to the Civil Air Patrol.

In sum, what we have described so far is--in a very real sense--the structure of the SAR Community in the state of Washington. But that is only

half the story. For a complete understanding, we need to take a look at the process of doing SAR--the actual patterns of behavior which arise in various parts of the overall system to meet the SAR demands.

In a very real sense, each SAR mission is unique. The particular set of demands, the configuration of responding organizations, and the resultant actions of the multiorganizationsl system all add up to a SAR mission like no other SAR mission. Hundreds of external factors can be an influence. Yet, there are general patterns which characterize most SAR missions. Patterns of interorganizational behavior. Patterns which we have been able to identify in unraveling the complex process of doing SAR.

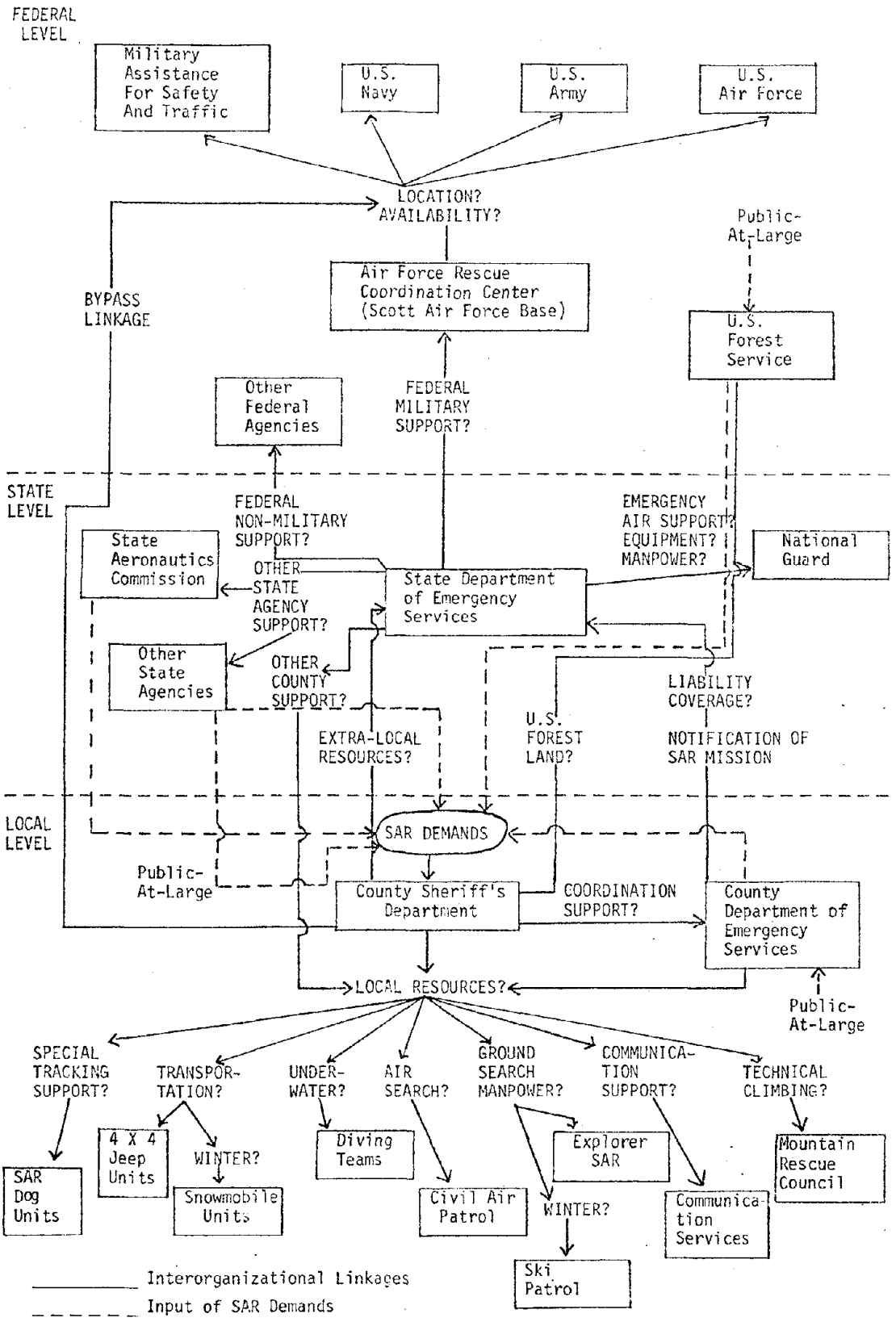
The initial factor which determines which patterns will become activated is the type of mission--whether it is a ground, air, or navigable waterway mission. When one thinks of SAR, however, it is typically the ground search and rescue mission which readily comes to mind. The lost hiker or injured mountain climber in a remote recreation area are examples of this type of mission. So too is the SAR response to Mount St. Helens. As seen in Figure 4, a variety of response patterns can emerge, depending upon the specific SAR demands which need to be met by specific SAR resources.

Taking a close look at this "social map", we begin where SAR begins--with the county sheriff's department. As the local legal authority, SAR demands are communicated to the sheriff's department through a number of sources (as represented by the dashed lines in Figure 4). A request for a SAR response can come directly from the public-at-large--usually a friend, relative, or someone who happened to be in the area, or indirectly from the county DES, U.S. Forest Service, the State Aeronautics Commission, or other state agencies. This request is then investigated by sheriff's department personnel to determine if a SAR mission is necessary and what resources are adequate. However, if

FIGURE 4

STATE OF WASHINGTON

A SOCIAL MAP FOR A GROUND SAR MISSION*



additional manpower and/or equipment is warranted, then interorganizational linkages become activated. The more resources needed, the larger and more complex the multiorganizational system grows.

Depending on a variety of factors--location, weather, terrain, foilage, characteristics of the victim, the size of area to be covered, and so on--sheriff's department personnel in charge of the mission will contact the appropriate organizations. Local resources will be utilized first. At the same time, they will notify the State DES and, if volunteers are used, obtain a mission number for liability coverage.

What is important to recognize here is that a ground SAR mission is very much a local level operation. Horizontal integration becomes established first. Vertical integration only takes place when local resources are exploited or not able to meet the particular demands of the SAR mission. This is when the State DES assumes its role as a linking-pin organization in activating extra-local resources.

If the county sheriff's department requires resources outside of its county for a SAR mission, it formally requests them through the State DES. The only exception here is the U.S. Forest Service, which it contacts directly if the mission is on Forest Service land. Once the State DES receives the request, it can activate any number of interorganizational linkages,depending on what particular resources are needed. The most frequent request is for emergency helicopter transportation, which is usually forwarded to the AFRCC. At the same time, the county sheriff's department which made the original request might contact a helicopter SAR unit directly so that they will be forewarned of the emergency situation and the need for them to respond as soon as possible. Such a bypass linkage, whether formally or informally acknowledged,

appears to be a necessary part of the vertical integration of the system. Although this process has involved some conflict concerning its legitimate use by county sheriff's departments, it undoubtedly has saved lives by decreasing the response time.

Other kinds of extra-local resources include volunteer SAR organizations from other counties and other state and federal agencies which can provide additional manpower and/or equipment, especially if the mission continues over a period of days. Military agencies will also provide additional manpower if necessary.

As you can see, a SAR response is far from a simple operation. Given the particular circumstances of the SAR demands, a whole range of interorganizational patterns can come into play in the development of a multiorganizational system--all of which exist to save lives.

And the Level of SAR Demands

We conclude our review of the Washington State SAR Community by examining the level of SAR demands. That is, just how much searching and rescuing actually occurs in the state of Washington--especially in Cowlitz, Lewis, and Skamania counties?* It is interesting to know that there are those various organizations ready and willing to participate in SAR. And it is interesting to know that an interorganizational SAR system exists to get resources to where they are needed, and when they are needed. But how often these organizations and this system responded to SAR demands is important to understanding the level of experience that existed prior to the May 18, 1980, eruption of Mount St. Helens.

For 1978, a total of 378 missions were reported to the State DES.**

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*We will focus on these three counties because they were the most involved in the Mount St. Helens SAR response.

**These data are based on the latest statistics compiled by the State DES. They reflect only those SAR missions which were supported by the State DES and volunteers and, therefore, were assigned a state mission number.

Of this total, Cowlitz County reported 15 missions, Lewis County reported 17 missions, and Skamania County reported 20 missions--all above the statewide average of 10 missions per county. An additional 10 training missions were indicated for Cowlitz County. None of these missions, however, involved a response to a disaster.

In an independent survey of county sheriff's departments which we conducted in early 1979, these same three counties indicated some additional SAR activity in 1978 not involving the State DES. While Cowlitz and Lewis counties reported an additional three missions, Skamania County reported a total of 43 missions for 1978. Clearly, all three counties experience a SAR demand at least once every three weeks on the average. And most of these missions did engage the interorganizational SAR system via the State DES.

What extra-local resources were used for these missions? From the data available to us, we do know that federal (military) air support amounted to 579 hours statewide in 1978, whereas state and county air support was about 188 hours. Comparable statistics for Lewis and Skamania Counties are 195 and 17 hours, respectively; however, Cowlitz County reported no air support for 1978.

And finally, a total of 489 victims were searched for and/or rescued by the Washington State SAR Community in 1978. Fifty-eight percent were found alive, 18% were found injured, another 18% were found dead, and only 6% were not found at all. Sixty-five of the 489 victims were in Cowlitz, Lewis, or Skamania Counties, which averages out to about one victim per mission.

Summary

In sum, we have discovered that SAR activities are certainly not unfamiliar to the state of Washington as a whole, as well as the three counties most involved in the Mount St. Helens response. Search and rescue has consequently

become a fairly routine activity for a variety of local, state, and federal organizations--especially in counties along the Cascade Mountain Range. Such routinization is based upon an interorganizational system that has evolved over the years to get resources to where they are needed, when they are needed. And this system appears to have worked well, both in terms of the percentage of victims found alive or injured, and the national acclaim the Washington State SAR Community has received in the past.

Yet, what does this have to do with the SAR response to Mount St. Helens? As we shall see in the following chapter, certain aspects of this interorganizational system had a direct influence on the events that occurred both prior to and following the May 18 eruption. For example, it is important to know that the county sheriff has legal authority for SAR in his county; that the State DES is a coordinating agency for SAR activities and acts to support local efforts; that the USFS is minimally involved in SAR and, like the State DES, supports the efforts of the county sheriff when it does become involved; that informal interorganizational linkages play a big part in making the system work; and that SAR missions in remote recreational areas has become a fairly routine operation in many of the counties along the Cascade Mountain Range.

On the other hand, we also know that this system had not been tested for the magnitude and complexity of SAR demands that Mount St. Helens presented in such an awesome fashion. The state has been faced with floods, drought, windstorms, and icestorms in the recent past, but those were not of the magnitude or frequency of the tornadoes, hurricanes, and so on, that plague other parts of the country (Legislative Budget Committee, 1980: 77).

Keeping this background information in mind, let us now turn to a description of how various agencies specifically planned for a major eruption of the volcano.

CHAPTER III

PRIOR PLANNING ACTIVITIES

In a very real sense, a complete understanding of the Mount St. Helens SAR response must begin well before any helicopter touched down on an ash-ladened landscape. We have already presented a general overview of the Washington State SAR Community in the previous chapter. Now we want to review the planning activities which were specifically conceived to respond to a possible eruption of the volcano. As indicated in the disaster literature (Barton, 1969; Form and Nosow, 1958; Dynes et al., 1972), prior planning directly influences how a community responds once such a possibility becomes a stark reality.

Compared to other types of natural disasters that strike with little or no forewarning--such as tornadoes, flash floods, and even hurricanes--Mount St. Helens gave indications of an impending eruption almost eight weeks in advance. Such a lead time provided local, state, and federal agencies with an opportunity to plan SAR responses. And such planning could focus on specific areas for various possible events, rather than the more general process of planning for a type of natural disaster that could occur anywhere within a fairly large geographical area. For a volcano, the ability to predict some potential areas of impact is much more feasible than, for example, for a tornado or hurricane; i.e., volcanoes, as sources of devastation, do not move, even though ash and mudflow effects can extend for considerable distances away. Thus, what we learn from the Mount St. Helens experience can aid us in planning for future eruption of other volcanoes. In addition, such knowledge can be applicable to preparing for a major earthquake, a type of natural hazard that has many similarities to what occurred at Mount St. Helens.

Federal Level

In any disaster planning process, emergency response agencies must rely upon the best available information about the potential impacts of an impending disaster. The more reliable and specific that information is, the more exact the response plan can be. For Mount St. Helens, it was the U.S. Geological Survey (USGS) which provided such information.

There were two aspects to this role. First, the USGS provided information on what would be the likely impacts of a major eruption based on evidence of previous eruptions. Second, it analyzed and interpreted the daily events of the volcano once it became active with the hope of giving officials a more precise forewarning to the possibility of a major eruption.

Perhaps the first activity directed at planning for a Mount St. Helens eruption was the publication of a Geological Survey Bulletin entitled "Potential Hazards From Future Eruptions of Mount St. Helens Volcano, Washington" (Crandell and Mullineaux, 1978). As leading experts on Cascade volcanoes, the authors state that they believe Mount St. Helens "to be an especially dangerous volcano because of its past behavior and the relatively high frequency of its eruptions during the last 4,500 years" (p.C1). They go on to describe the nature and products of future eruptions, including the possibility of "lateral blasts of great force which can carry steam and rock fragments from the dome outward at a high speed to distances of at least 10 kilometers" (p.C9). They also suggest that "If a major eruption occurs, one of the greatest potential hazards includes Swift Reservoir" (p.C15) and that its water should be lowered if the volcano became active.

In terms of other mitigation activities, however, Crandell and Mullineaux admit that while "future eruptions of Mount St. Helens are a near certainty. . . Mount St. Helens' lack of recent activity, and our limited knowledge of volcano behavior in general, preclude our knowing what kinds of premonitory events and which monitoring techniques will provide the most reliable warning. Furthermore, monitoring does not indicate the kind or scale of an expected eruption, or the areas that might be affected" (p.C22).

As to when and what kind of an eruption is likely to occur, they suggest that "an eruption is more likely to occur within the next hundred years, and perhaps even before the end of this century. . . Because of the variable behavior of the volcano, we cannot be sure whether the next eruption will produce lava flows, pyroclastic flows, tephra, or volcanic domes, or some combination of these" (p.C25).

In sum, we find that the best scientific evidence **available** indicated the inevitability of a future eruption, but remained fairly ambiguous on the specific circumstances of that eruption--the type of information which would most likely have a more immediate impact upon decision-makers. Thus, in a later article, it is not surprising to find the same authors noting a "general public disregard for the possibility of future eruptions" and that the infrequency of eruptions "hardly encourages the perception of volcanic eruptions as a direct and immediate danger comparable to others encountered in everyday living" (Crandell et al., 1979: 197). Such disregard, however, was soon to be replaced by a national fascination with this wonder of nature's forces.

It was at 3:47 p.m. on March 20, 1980, that an earthquake of magnitude 4 occurred under Mount St. Helens, signaling a reawakening of the volcano

after 123 years of dormancy. As series of earthquakes continued to be registered over the next few days, scientists from the USGS and the University of Washington geophysics program notified federal and state officials of the real possibility of volcanic activity. Since Mount St. Helens is located in Gifford-Pichot National Forest, the U.S. Forest Service (USFS) Supervisor's Office in Vancouver became the lead federal agency to respond to these early warnings. On March 25, it implemented an area closure "which restricted all activities above timberline and essentially closed the mountain to the general public" (USFS, 1980a). This action was taken in response to the avalanches being triggered by the frequent quake activity.

The next day, the USFS called a meeting of federal, state, and local agencies, as well as private and corporate landowners to "develop a framework for an interagency contingency plan which would provide a coordinated response to an emergency" (USFS, 1980a). Thus, almost two months prior to May 18, the importance of developing a mechanism for interagency coordination was recognized. The major result of this meeting was the establishment of an Emergency Coordination Center (ECC) at the USFS's office in Vancouver. The USFS was recommended to be the lead agency for this coordination effort. They had more resources to devote to the ECC than any other agency; they were centrally located between Skamania and Cowlitz Counties and were accessible via Portland International Airport; and they did have a like experience in fighting forest fires. So, they were the most logical choice, according to most of our respondents.

The ECC would function to coordinate aerial observation hazard assessment data and other pertinent information which would then be

communicated to the appropriate agencies. A public information officer would handle all media requests as well as public inquiries. Twenty-four hour hot lines were established with the USGS, the University of Washington geophysics program, the State Department of Emergency Services (DES), Skamania, Clark, and Cowlitz Sheriff's Departments, Pacific Power and Light (for Swift Reservoir), and Portland General Electric (for Trojan Nuclear Power Plant located on the Oregon side of the Columbia River). When volcanic activity warranted it, liaison personnel from each of these agencies would report to the ECC and utilize the hot lines to feed essential information back to their respective agencies.

Specific arrangements also were made to establish control over access to the mountain and to lower the water level of Swift Reservoir--one of the biggest threats to human safety if there was a mudflow down the south slope, as identified by the Crandell and Mullineaux report (1978: C15). Airspace around the mountain was restricted on March 27 by the Federal Aviation Administration, disallowing all but official aircraft from flying below 20,000 feet or within five miles of the summit.

After several follow-up meetings, a written contingency plan (USFS, 1980a) was finalized and distributed to the various agencies during early April. Although it established an ECC with interorganizational communication capabilities, this plan did not address the possibility of a SAR operation following a major eruption. Concern over that possibility was expressed at some of the USFS-sponsored meetings, but no specific actions were taken.

Why? There are a number of answers to this question, the combination of which set the stage for the soon-to-follow planning efforts of individual agencies. In a very real sense, this initial set of meetings created

the posture that organizational managers would use in their own approaches to the impending disaster. Understanding this posture is central to an examination of the entire planning process.

With little doubt, the underlying basis to this posture was what could be expected to happen during a major eruption--as reported by scientific experts from the USGS. Most of our respondents left the USFS meetings thinking that flooding caused by pyroclastic flows and mudflows would occur down the south or north slopes. With Swift Reservoir lowered, it could accomodate any flows toward the south. However, flooding was anticipated to occur along the north and south forks of the Toutle River, and the Kalama River. Thus, this potential impact increasingly became the primary focus of pre-disaster preparations--especially as the north slope began to bulge outward during the following weeks.

Ashfall and associated electrical storms also were a concern, and communication linkages were outlined in the plan to inform various agencies of ash emissions as they occur. Yet, where the ash would travel depended on wind conditions prevalent during an eruption and thus could not be forecasted in advance.

An eruptive blast, however, was not seriously anticipated by any of our respondents, despite that possibility being indicated in the Crandell and Mullineaux report (1978: C9).

A second important factor was the uncertainty of when a major eruption would occur. Given that it could occur anytime before the end of the century, there was little perceived threat of an immediate eruption.

Third, as a result of these expectations, the planning process began and continued to be focused on first, keeping people away from the mountain

by roadblocks on access roads,* and second, developing evacuation plans for those living along the potentially affected river valleys. If these two tasks were successfully carried out, the need for SAR would be kept to a minimum and be met by each county on an individual basis. Consequently, a large scale, multi-jurisdictional SAR operation was not anticipated by the majority of our respondents.

And fourth, everyone recognized the legal authority of the county sheriff for all SAR activities. USFS personnel never perceived their role as directing SAR response; rather, they saw their role as it routinely is in any SAR effort--to provide resources in support of the sheriff. In addition, although the USFS had similar experiences in fighting fires, they were not well acquainted with SAR management or resources even if they had been expected to direct the Mount St. Helens response. And too, they like others looked to the State DES to more directly coordinate the SAR operation in conjunction with the county sheriff's department if the need arose. Again, as outlined in Chapter II, that is the proper role of the State DES.

State Level

It was on April 3 that Governor Ray signed a declaration of emergency in the state, authorizing the state disaster preparedness plan to be implemented and all state resources be employed as deemed necessary. As specified in the plan, the State DES took the lead role in preparing the state to respond to a major eruption. Assisting in this effort was the governor-appointed Mount St. Helens Watch Group. Composed of the heads of eight state agencies, that group was a mechanism for interagency coordination at the state level.

By late April, a Mount St. Helens Contingency Plan (1980) was written

*For example, an estimated 100-125 USFS personnel manned approximately 44 access gates 24 hours a day.

by State DES personnel as a supplement to the general state disaster plan. Like the USFS plan, the primary focus was on the establishment of an Emergency Operation Center (EOC), but at DES headquarters in Olympia. The document briefly outlined steps to be taken by agency personnel following a major eruption. Duty officers, EOC activation, communication room procedures, public information, ashfall reporting, air traffic control, and a list of names and phone numbers are included in the plan. Other state agency involvement, the last section of the report, was never written prior to May 18, however, nor was any specific planning for a SAR response.

Again, we find numerous reasons for this omission, many of which echo those stated previously concerning the USFS plan--the perception that a large scale, multi-jurisdictional SAR operation would not be necessary if roadblocks and evacuation plans were effective; the perception that a major eruption was not imminent; and the perception that each county would handle their own SAR needs as they occurred, under the authority of the sheriff. The state DES took the position that its role would be as it routinely is in the SAR interorganizational system. That is, it would support local efforts by coordinating non-local resources, (i.e., state and federal resources, as requested by the county sheriff's department or DES). Thus, a detailed SAR plan specific to Mount St. Helens was not viewed as a priority by this key state agency.

Yet, given the central importance of the State DES in disaster preparedness and response, it is important to understand the circumstances within which this agency operated to prepare for a major eruption. In a performance audit report (1980) written for Washington's Legislative Budget Committee and released four months prior to May 18, the agency was

given less than a favorable evaluation. The audit noted "The lack of written specific, quantifiable objectives for the Department of Emergency Services, or for any of its programs and activities. . . did not provide the agency with the means to fulfill its mandated duties" and that the agency "appears to have been functioning for a number of years in a reactive mode" (p.23). Commenting on the agency's organizational structure, it states that "Some staff members. . . expressed some confusion and indecision as to who their superiors were and what the line of authority actually was" (p.25).

In a letter accompanying the legislative report (pp.102-108) from the then regional director of the Federal Emergency Management Agency (FEMA), a number of other deficiencies are listed: 1) no specially designed or constructed emergency operating facility; 2) no regional EOC's for conducting statewide emergency operations; 3) no statewide comprehensive analysis of national and man-caused hazards which may cause property damage and loss of life; 4) fragmented and uncoordinated communications system; 5) no Governor's Emergency Fund for disaster relief, thus forcing the Governor to seek a special appropriation from the legislature for any extraordinary situations; 6) no one on the DES staff intimately knowledgeable about the state disaster plan and no SOP's (Standard Operating Procedures) for other state agencies; and 7) no state funded positions totally devoted to national disaster preparedness activities. The letter concludes:

> "It is our opinion, in evaluating the overall operation of this State's disaster response programs in comparison to similar programs in other States, Washington ranks at or near the bottom of the list. We do not sense a serious commitment to disaster response programs or to disaster preparedness" (p.108).

Although there was some disagreement on these views (see pp.109-119), suffice it to say that the effectiveness of the agency was being seriously

questioned by federal, state, and local officials (see pp. 62-78) during the year prior to Mount St. Helens reawakening.

Partly in response to this on-going questioning, the then-director of the State DES began a reorganization of the agency. Priorities were redefined, leading to a change in responsibilities for many of the 24 full-time staff members. Consequently, the State Coordinator of Search and Rescue, a position defined by law (Chapter 38.52, Revised Code of Washington), was merged with the position of Manager of the Emergency Preparedness and Operations Division. Thus, without a full-time SAR Coordinator, the agency's ability to meet the changing needs of the SAR community was to some extent hampered.

For example, the State DES-sponsored SAR Council, an advisory group composed of representatives of local, state and military agencies, had not met for over a year prior to May 18. Much of the strength of the state's SAR Community grew out of the efforts of this group with those of the SAR Coordinator. The interorganizational system continued to respond well to the routine, remote setting mission due to the success of these past efforts (see Legislative Budget Committee, 1980: 47-48). When Mount St. Helens became active, however, this mechanism for interorganizational coordination within the SAR Community was not a viable option.

Thus, with a priority of demands associated with the volcano placed upon the reorganizing agency, and without a full-time SAR Coordinator, the lead role that many expected the State DES to take in coordinating the SAR response never materialized. Given the anticipated impacts of a major eruption, the legal authority of the county sheriff for SAR, and the efforts by the USFS to coordinate efforts from their Vancouver office, this

lack of leadership was not viewed as a major deficit by DES personnel.

Another state-level organization involved in prior planning efforts was the National Guard. Under the authority of the Governor's declaration of emergency, guardsmen immediately began to assist the State Highway Patrol and county sheriff's departments in manning the many roadblocks around the mountain. A plan was also drawn up which specified how the Guard would respond to a major eruption. According to our respondents, this plan was based upon a worst-case scenario which foresaw the possibility of people isolated by mudslides; an interruption of power and telephone lines; a need to move supplies to affected communities through high water and heavy ashfall; and a need for helicopter rescue missions. Given this potential set of circumstances, a total of 2,500 personnel plus equipment was chosen as the designated force.

During the weekend of April 25, the helicopter group assigned to Mount St. Helens force met to plan its specific response. At that meeting, the towns of Toledo, Chehalis, and Centralia were chosen as potential base camps to stage a rescue operation. After visiting each, Guard officials selected the Toledo airport. This site was out of the way of anticipated flooding and was accessible to Camp Murray and Fort Lewis Army Base where helicopters, supply trucks, and the National Guard EOC were located. Finally, with their annual drill training in Yakima scheduled for the weekend of May 16, they also discussed what actions would be taken if the volcano erupted during that time.

With the National Guard, we find for the first time specific decisions made in anticipation of a possible SAR response. Yet, this planning effort had a major drawback--no other organizations were involved

in it. Nor was there any serious effort to make them aware of it. Reasons for this failure remain vague, but revolve around the idea that the National Guard was acting under the direction of the Governor and her declaration of emergency as opposed to any legal authority of the State DES, the USFS, or local sheriff's departments. In addition the Guard assumed that they would be the only aviation unit responding. Thus, their mode of operation was envisioned to be more or less independent of other agencies. Coordination with local officials would occur when the need arose in the field. In retrospect, one of our respondents from the National Guard recognized this situation in this way: "We had not come to grips with planning for and reacting to a major disaster that crossed political boundaries."

Local Level

On the local level, representatives from the Skamania, Clark, and Cowlitz County Sheriff's Departments were directly involved in the USFS planning effort described previously. Again, the approach was to keep people away from the mountain via roadblocks and develop evacuation plans in case of flooding.

In Cowlitz County, where it was anticipated that major flooding was most likely to occur, the sheriff's department developed an evacuation plan for residents in the Lewis, Kalama, and Toutle Rivers drainage areas. Pamphlets containing information about what to do in case of an eruption were distributed; a telephone ring-down system in the most susceptible areas was established; and a warning system consisting of high/low sirens and public address systems were specific actions taken by local agencies (Perry et al., 1980). The county also had a SAR plan for a remote setting mission, but no specific efforts were make for a Mount St. Helens SAR response.

Such was also the case for Skamania County. Although Mount St. Helens is located in the northernmost part of this county, the majority of its population is in the southern end near the county seat of Stevenson. In addition, main access to the mountain is through Cowlitz County via Highway 504. Thus, the two county sheriff's departments had developed a working relationship for SAR missions on the mountain in the past. In anticipation of a major eruption, they supported Cowlitz County's evacuation planning as well as assisted in manning roadblocks. A pamphlet was also distributed to Skamania County residents explaining what to do in case of an eruption and an accompanying ashfall.

Clark County, where the city of Vancouver is located, was also included in the USFS contingency plan. Because any major impact in that county was considered unlikely, the sheriff's department was to support the efforts of Skamania and Cowlitz counties.

Similarly, Lewis County, located north of the mountain, was not expected to receive any significant impact other than ash. Therefore, the county sheriff's department was minimally involved in prior planning efforts with other counties or the USFS. During March and April, SAR groups in this county did discuss a possible SAR response to a major eruption, but not in any great detail.

The last major planning decision came on April 30, when Governor Ray declared formal red and blue zones around the mountain at the urging of the USFS and the county sheriffs. The red zone, which has been reported to have been much smaller than either law enforcement or USGS personnel recommended (The Oregonian, October 27, 1980:U12-U13), was closed to everyone. The blue zone, however, would be open to loggers during daylight hours and to property owners who obtained special permits.

Violators could be fined up to $500 and six months in jail, according to the governor's declaration.

And yet, despite such action to keep people away from the active volcano, it was fairly easy for anyone to circumvent the roadblocks by using the mumerous logging roads all around the mountain. And numerous people did just that to the frustration of law enforcement personnel manning the roadblocks. In addition, pressure from owners of property inside the red zone mounted. The governor finally allowed a caravan of owners to travel up to Spirit Lake on May 17 to check on their property and gather any belongings they wished to bring out. A second trip was also planned for Sunday, May 18 to enter the restricted zone.

Assessing the Planning Efforts

Given this brief review of the planning activities, how prepared were the various agencies for a SAR response to a major eruption of Mount St. Helens? In view of the circumstances at the time, should more have been done? Addressing such questions is by no means an easy task--and we do not presume to have a complete or final answer. We can point out some of the positive as well as problematic aspects to these plans, based not only upon the perceptions of our respondents but also on our previous research on other natural disasters (Drabek et al., 1981).

On the positive side, the fact that plans specific to a Mount St. Helens response were discussed and written cannot be overlooked in any understanding of what occurred following the eruption. The USFS effort, in particular, did bring many key agencies together to start thinking about coordinating their individual responses. An ECC with interorganizational lines of communication was established--a basic ingredient to any effective disaster planning. An attempt was made to keep people away from the mountain in

the hope of preventing loss of life and a SAR response. Specific evacuation plans for those most susceptible to the major anticipated threat, flooding, were in place. Swift Reservoir was lowered to prevent flooding to the south. And contingency plans were written by the two state agencies most likely to become involved in a SAR response--the State DES and National Guard. Again, each of these actions was predicated on what was predicted to happen during a major eruption. Without a doubt, they played a part in preventing a greater loss of life following the May 18 eruption.

On the other hand, we can isolate certain aspects to these planning efforts that, in hindsight, help to explain why the SAR response unfolded as it did. For example, a large-scale, multi-jurisdictional SAR operation was not anticipated and, therefore, not planned in any specific manner. Lewis County officials were minimally integrated into any of the aforementioned plans. There was no full-time SAR Coordinator at the State DES. And, National Guard plans were not interorganizational in nature or even communicated to other response agencies.

Yet, we do not have a complete perspective on the prior planning efforts unless we consider underlying factors that pervaded the entire process. First, it is critical to understand the political nature of the planning process. Decisions had to be made which affected private property owners, logging interests, recreational interests, and a multitude of private and public organizations. And too, these decisions were made in an atmosphere of uncertainty, which allowed the various parties to question anything contrary to their own interests. Or, to put it another way, if it would have been possible to know exactly what was going to happen during a major eruption and when it was going to occur, then planning decisions

become fairly straightforward. Unfortunately, nature's forces are not that cooperative.

This brings us to our second point. With the first signs of Mount St. Helens reawakening, the USGS was thrust into the limelight of local, state, and national attention. It was this agency that organizational managers, the media, and the general public expected to readily provide the answers to what was occurring and what would occur in the future. And it was expected that USGS had the answers--answers which would form the basis of policy decisions in a straightforward manner. Yet, given the many unknowns about volcanic behavior and the typically cautious approach of scientists, such answers were not always forthcoming--to the dismay of officials who were faced with decisions. Such a public relations role was not entirely familiar to this essentially scientific organization; in a very real sense, USGS personnel were learning along with everyone else.

Third, heightening the difficulty of the planning process was the continuous presence of the media. Local, state, national, and even international media descended upon the various agency officials. How to handle such attention was unfamiliar to many of them. Yet, it was through the media that the public could effectively be advised of the dangers of the volcano and discouraged from entering the area.

And fourth, many of our respondents indicated the lack of any additional funding for planning purposes. Without a state emergency fund or federal disaster funding, all agencies had to rely upon their existing revenue base. Especially for the smaller county sheriff's departments, just manning the roadblocks proved to be a major drain on their budgets. And while Mount St. Helens was presenting a large and unforseen demand on these agencies,

their day-to-day operations had to continue. As one of our respondents put it, "We were trying to nickel-and-dime a people/management need when we ought to have been playing with bigger players at the very beginning. . . so that we could get the required funding and the manpower for the right kind of people management. We didn't get that. We never had that."

Prior Interorganizational Linkages

Another approach to assessing pre-disaster conditions is by examining the nature of routine interorganizational linkages among the responding agencies. This approach is predicated on the idea that organizations which interact and coordinate with each other prior to a disaster will have less problems doing so in response to the disaster (Dynes, 1978), and vice-versa. Such linkages are especially critical for the central core of organizations that direct the immediate emergency response and supply the bulk of resources.

Thus, we were interested in measuring three types of interorganizational linkages--communication, coordination, and conflict prior to May 18. Such interaction is exclusive of the various planning efforts initiated for a Mount St. Helens response. We also wanted to focus on the 12 primary SAR organizations rather than the entire 27 in our sample. These include the USFS in Vancouver, the State DES, and the three sheriff's departments as the SAR authorities at the federal, state, and local levels; the Army National Guard, 304th Air Rescue and Recovery Service (ARRS-US Air Force), and the 3rd-5th Calvary (US Army) as units that respond on a routine basis to ground SAR missions in the state of Washington; and the Civil Air Patrol (CAP), the 54th Medical Detachment (US Army), the 593rd Support Group (US Army), and the 6th Detachment, 602 Tactical Air Control Wing (TACW-US Air Force) as other key SAR resources that responded

to the Mount St. Helens mission but are not included in ground SAR missions on a regular basis.*

In terms of prior communications, we find that less than half (47%) of the possible linkages among these 12 organizations actually existed during the year prior to the eruption (see Figure 5). Almost one-half of the most frequent contacts (i.e., about once a week) involved the State DES, signifying this agency's central place in the interorganizational SAR system. More importantly, however, was the lack of linkages with the last four organizations (i.e., other SAR resources). As clearly indicated, 52 out of 62 absent linkages (84%) involved these organizations. This indicates they they were not as likely to have established a working relationship with the other responding agencies prior to the May 18 eruption. Especially critical was the almost complete lack of any communication with the USFS and three local sheriff's departments, as perceived by our respondents. Again, these respondents were in charge of their respective organization's SAR response for Mount St. Helens. Keep these data in mind as you read a description of their actions in the next two chapters.

We can further describe the linkages that did exist in terms of coordination and conflict (see Figures 6 and 7). Our data show that the great majority of routine, pre-disaster interactions among the 12 primary SAR organizations was very well organized (71%) and involved no disagreements (76%). Of particular note, however, is the lack of prior coordination between the Army National Guard and the Lewis and Cowlitz County Sheriff's Departments, the 304th ARRS, and the 3rd-5th Cavalry, as perceived by the

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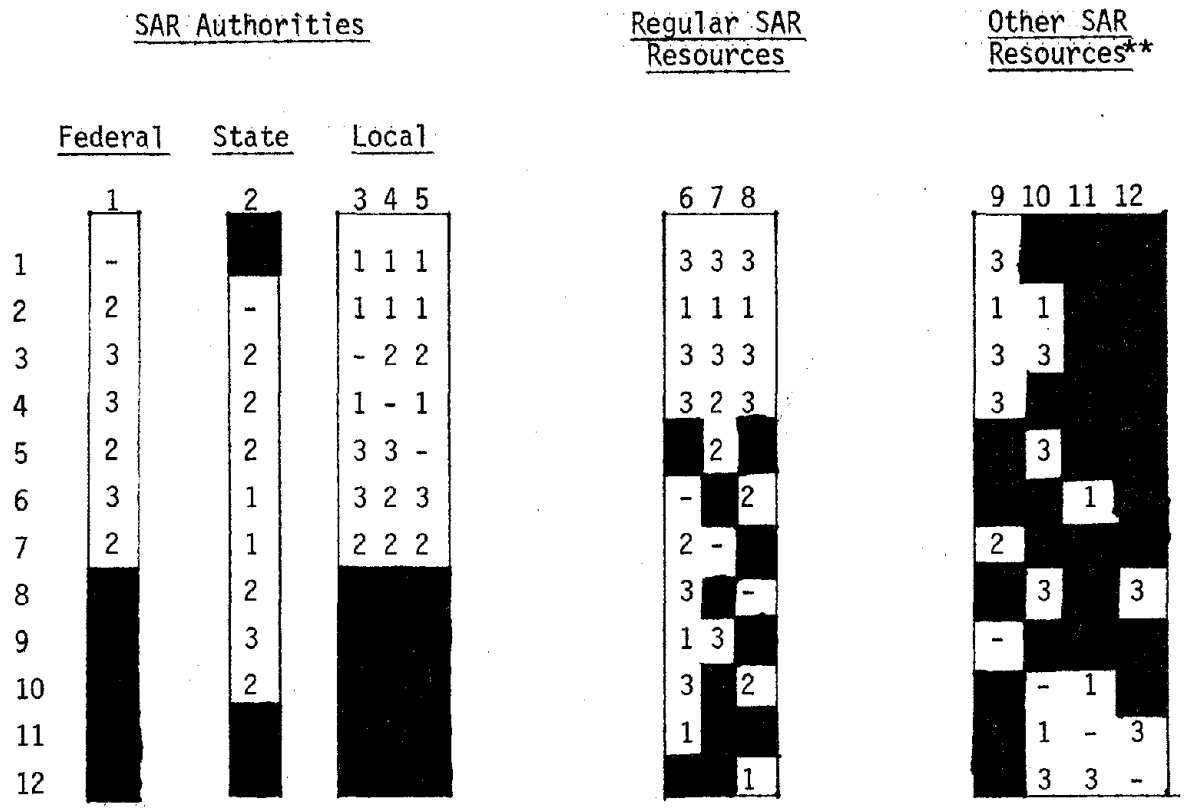
*Although the CAP is routinely involved in SAR, it for the most part responds to missing aircraft missions which involves a different interorganizational system than the typical ground SAR mission (see Kilijanek, 1981).

FIGURE 5

MOUNT ST. HELENS
PRIMARY SAR ORGANIZATIONS
PRIOR COMMUNICATIONS*



1 = about once a week — 16% (21)
2 = about once or twice a month — 15% (20)
3 = 1-6 times a year — 22% (29)
■ = no communication during prior year — 47% (62)
100% (132)

Organizations:

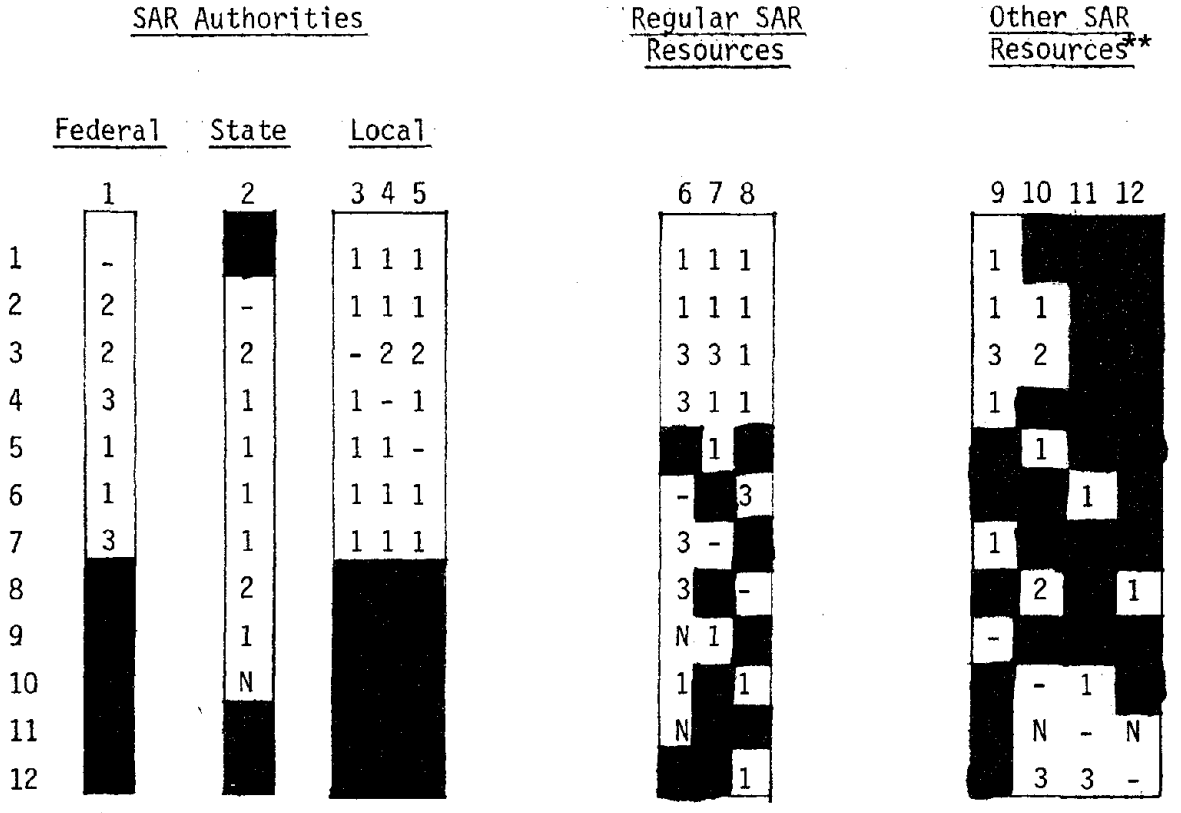
1. USFS (Vancouver)
2. State DES
3. Lewis County Sheriff's Dept.
4. Cowlitz County Sheriff's Dept.
5. Skamania County Sheriff's Dept.
6. Army National Guard
7. 304th ARRS (USAF)
8. 3rd-5th Cavalry (USA)
9. Civil Air Patrol (CAP)
10. 54th Medical Detachment (USA)
11. 593rd Support Group (USA)
12. 6th Detachment, 602 TACW (USAF)

*Each respondent was asked, "Approximately how often was there direct communication between your organization and each of these organizations during the year prior to the disaster?"

**Although the Civil Air Patrol is routinely involved in SAR, it for the most part responds to missing aircraft missions, which involves a different interorganizational system than the typical ground SAR mission (see Kilijanek, 1981). The other three organizations in the group are not routinely included in either air or ground SAR missions.

FIGURE 6

MOUNT ST. HELENS
PRIMARY SAR ORGANIZATIONS
PRIOR COORDINATION*



1 = very well organized
2 = somewhat organized
3 = slightly or not organized
■ = no communication during prior year

71% (46)
12% (8)
17% (11)
100% (65)

Organizations:

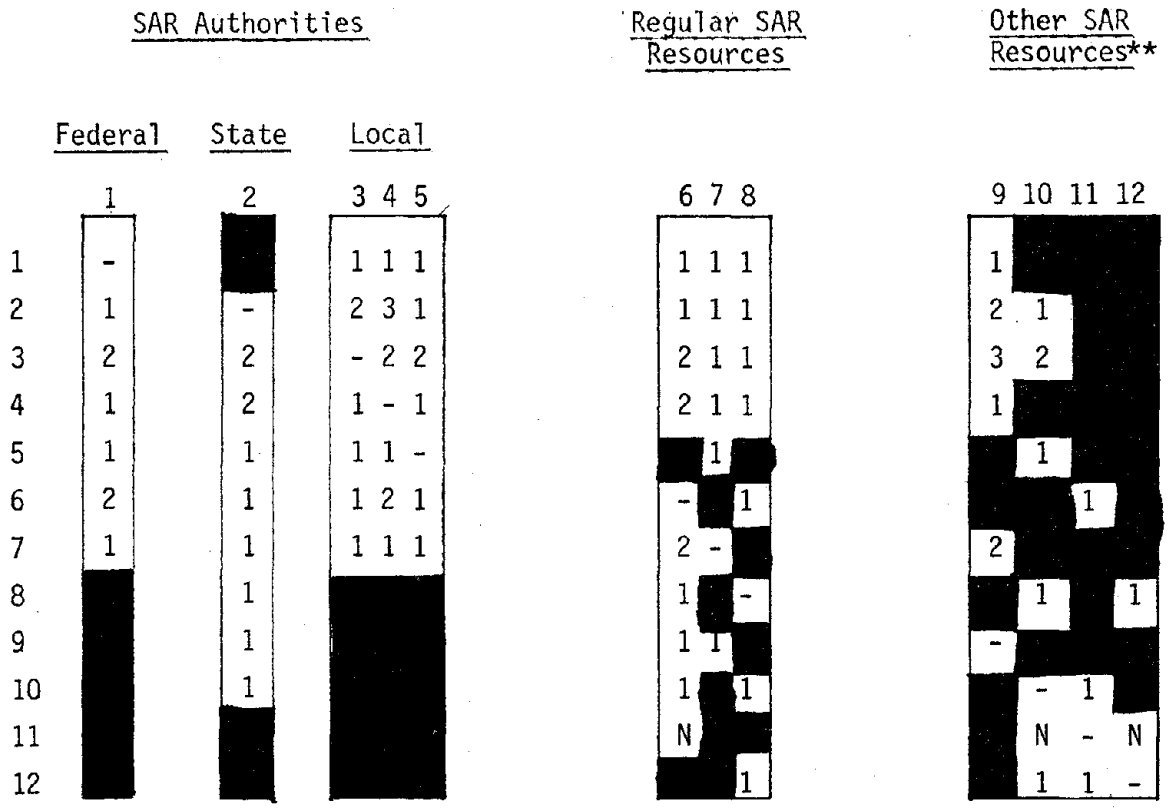
1. USFS (Vancouver)
2. State DES
3. Lewis County Sheriff's Dept.
4. Cowlitz County Sheriff's Dept.
5. Skamania County Sheriff's Dept.
6. Army National Guard
7. 304th ARRS (USAF)
8. 3rd-5th Cavalry (USA)
9. Civil Air Patrol (CAP)
10. 54th Medical Detachment
11. 593rd Support Group (USA)
12. 6th Detachment, 602 TACW (USAF)

*Each respondent was asked, "In the year prior to the disaster, how well organized were the activities of your organization and each of the other (meaning that these organizations intentionally worked together in a coordinated way)? N = No Response.

**See footnote, Figure 5.

FIGURE 7

MOUNT ST. HELENS
PRIMARY SAR ORGANIZATIONS
PRIOR CONFLICT*



1 = no disagreements
2 = 1-2 disagreements
3 = 3-4 disagreements
■ = no communication during prior year

76% (51)
21% (14)
3% (2)
100% (67)

Organizations:

1. USFS (Vancouver)
2. State DES
3. Lewis County Sheriff's Dept.
4. Cowlitz County Sheriff's Dept.
5. Skamania County Sheriff's Dept.
6. Army National Guard
7. 304th ARRS (USAF)
8. 3rd-5th Cavalry (USA)
9. Civil Air Patrol (CAP)
10. 54th Medical Detachment
11. 593rd Support Group (USA)
12. 6th Detachment, 602 TACW (USAF)

*Each respondent was asked, "During the past year, how many times were there disagreements between your organization and each of the other organizations?
N = No Response.
**See footnote, Figure 5.

respondents from these four organizations (see column 6, Figure 6). Such a finding is another preindication of problems that arose during the SAR operation.

CHAPTER IV

THE MISSION OF A LIFETIME

Based upon the varied data collected from our sample of 46 organizational representatives, we present in this chapter a systematic and comprehensive description of the SAR response to the May 18, 1980, eruption of Mount St. Helens. Keep in mind, however, that we are isolating one type of activity from a multitude of others, which arose in response to the eruption, in local communities, across the state, and even in various parts of the country. Thus, we have captured but one part of the complex totality of man's response to this most vivid display of nature's forces.

Three aspects to the SAR response are discussed: 1) the sequence of events during the main SAR operation around the mountain; 2) a brief account of SAR activities in the ashfall area of Moses Lake and Ritzville; and 3) preparations taken for a possible SAR response to future eruptions of the still active volcano.

To reiterate our approach to the data, our task is to describe the SAR response as perceived by our respondents. Given the uniqueness and intensity of the situation, differences do appear in these perceptions. Therefore, we include them in our analysis, for they reflect many of the most significant aspects of our analysis. We do not intend, however, to explicitly or implicitly "take up sides" and judge the rightness of one view over another, or one organization over another.

Ultimately, our task as social scientists is to provide an analysis useful to both the SAR practitioner as well as the organizational researcher. Hopefully, we can all learn from the tragic event on that fateful day in May, 1980, at a mountain called St. Helens.

Setting the Stage

So, what were the circumstances on the morning of May 18, 1980? What was in the minds of our respondents concerning the volcano as they awoke that morning? Let's review the facts.

We find a volcano that had been active since March 27. A major eruption could occur at any time, but no one knew exactly when it would happen. All of our respondents had the posture--based upon USGS expertise--that the greatest threat would be flooding caused by avalanches and mud and pyroclastic flows down the north and/or south slopes. For the southern route, Swift Reservoir was lowered to accomodate the flows and lessen the threat. Concern was therefore focused on flows down the north slope, especially as a bulge appeared and continued to grow at a rate of approximately five feet a day. Ash was also an anticipated product of an eruption, but how much ash and its direction of travel could not be predicted beforehand.

Given these expected impacts, planning efforts focused on first, keeping people away from the mountain, and second, developing evacuation plans for those living along the Toutle, Kalamia, and Lewis river drainage systems. If both of these objectives were met successfully, then the necessity of a SAR response would be kept to a minimum--at least, that was the thinking of most of our respondents.

The first objective, however, was thwarted by the relative ease of bypassing the roadblocks on major access routes via the multitude of logging roads crisscrossing the landscape around the mountain. Thus, the morning of May 18 found dozens of people around the mountain--despite the officially declared red and blue zones. Among these people was David Johnston, a USGS geologist located 5.5 miles north of the volcano. Others were more cautious

and camped up to 14 miles to the north of the summit. In addition, owners of property within the red zone were planning to meet at the roadblock 11 miles west on Highway 504. Like the previous morning, they were to be escorted into the Spirit Lake area to check their cabins and retrieve their possessions. Fortunately, officials of the Highway Patrol and Skamania County Sheriff's Department delayed the departure time until 10 a.m. that Sunday morning. The caravan of cars would never form.

Meeting the second objective was less of a problem. The Cowlitz County Sheriff's Department, in conjunction with local fire departments, prepared evacuation procedures for the towns of Toutle, Silverlake, Cougar, and Woodland. Brochures were distributed to residents, informing then of these evacuating procedures.

Other significant planning activities included the USFS-sponsored interorganizational planning effort, establishing an ECC at their Vancouver office; the State DES contingency plan to supplement the state disaster plan; and the National Guard planning effort. Only the National Guard plan, however, contained any specific details for a possible SAR response--but other agencies were not involved or informed of these details.

The Sequence of Events: May 18 to June 1

It was at 8:32 a.m., May 18, 1980, that an earthquake measuring 5.1 on the Richter scale rumbled underneath Mount St. Helens. Without warning, the bulge that had been growing over the past weeks collapsed, signaling the beginning of a day of death and destruction.

What were the impacts? As described in Chapter 1, a massive avalanche slammed into Spirit Lake. Mud and pyroclastic flows raced down both forks of the Toutle River, followed by flash flooding along the Toutle and Cowlitz

Rivers. This was all predicted by USGS experts.

What was not anticipated was a gigantic lateral blast equal to the force of many megatons of TNT. This blast wave moved northward, followed by a steam powered air mass of pulverized rock, soil, ash, and debris. Having the unbelieveable force of a 300-mile-per-hour hurricane, this "stone wind" obliterated 156 square miles of pristine high country.

To the south, minor pyroclastic and mudflows moved down the Muddy River into Swift Reservoir. The level of the reservoir rose two feet, but the earlier lowering of the water level accomodated this rise. Thus, flooding along the Lewis River never materialized (Perry et al., 1980). The Kalama River drainage basin, however, did experience some flash flooding.

And then there was the ash. A towering cloud of finely pulverized rock dust rose 63,000 feet above the volcano, creating its own weather system. Darkness and lightning played havoc, as inches of the gray gloom descended on the surrounding countryside. Prevailing winds took the cloud in a northeasterly direction, showering some parts of the state with inches of ash. Mount St. Helens was now 1,270 feet shorter and beautiful no longer.

Sunday, May 18. Soon after Mount St. Helens began to unleash her fury, innumerable individuals, groups, and organizations ceased their Sunday morning routines to respond to the emergency. Among many others, four EOCs became operational within the first few hours. In Vancouver, the USFS ECC became fully activated in accordance with the written contingency plan. As illustrated in Figure 8, representatives from the Cowlitz, Skamania, and Clark County Sheriff's Departments, the State Highway Patrol, and the State DES, among others, arrived to man their respective hotlines.*

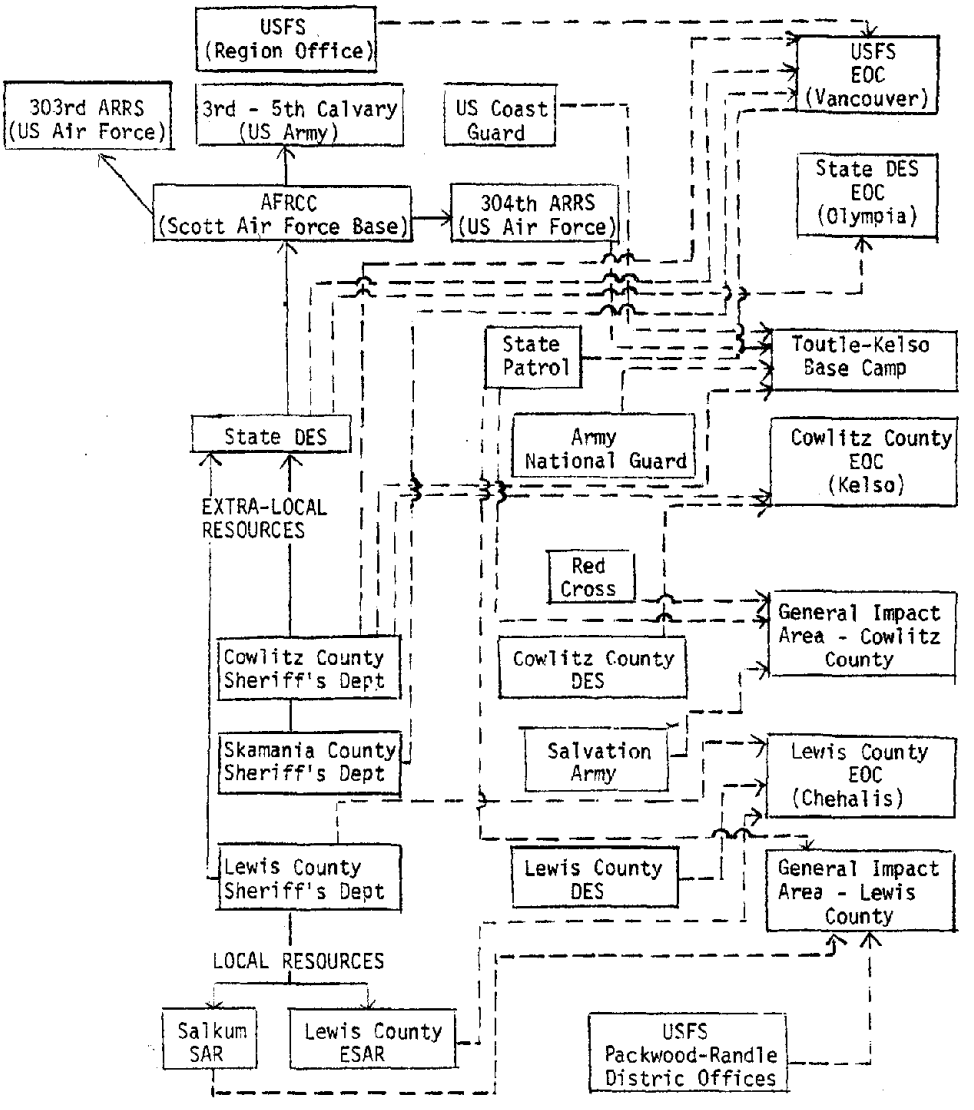
*These as well as other mobilizations are depicted in Figures 8, 9, and 10 by dashed lines.

FIGURE 8

MOUNT ST. HELENS

TRACING THE EMERGENT MULTIORGANIZATIONAL SYSTEM

SUNDAY, MAY 18, 1980



_____ Interorganizational Resource Linkages

_ _ _ _ _ _ _ _ _ _ Mobilization

Closer to the volcano, airborne USFS planes began a steady flow of information about the specifics of the eruption to the Vancouver ECC. Decisions were then made quickly--USFS district offices around the mountain began evacuation procedures; the Federal Aviation Administration was requested to restrict airspace below 50,000 feet and within a 50 mile radius; and the 304th ARRS, in Portland, Oregon, per previous arrangements, was requested for a SAR mission for David Johnston, the USGS geologist located 5.5 miles north of the summit. Soon the ECC was inundated by the media. The public information officer began what was to become a series of press briefings over the following weeks and months.

In addition to all of these SAR-related tasks, the USFS had to contend with their more usual task of fighting forest fires started by the hot ash. For that, the agency had a separate response system emerging at the same time (USFS, 1980b). Thus, like many of the key agencies involved in the SAR response, the USFS never was able to devote their entire resources to just search and rescue.

On the state level, the State DES activated an EOC at their headquarters in Olympia.* Telephone calls from county and state agencies, the media, and the general public inundated the agency. To handle the influx, personnel from other state agencies, the Civil Air Patrol, and the Red Cross were called in to assist the 24 full-time staff members. Yet, as outsiders to the agency, they had to be instructed on DES procedures rather quickly.

Among the hundreds of calls for emergency aid and information coming into the State DES EOC during the first few hours following the eruption, the Cowlitz and Lewis County Sheriff's Departments independently requested

*As indicated in Chapter II, the State DES did not have a specifically designed or constructed emergency operating facility. Therefore, just weeks before the eruption, a back room of the headquarters building was made into a makeshift EOC with raised wooden platforms and numerous telephone lines.

military resources for SAR missions.* The reason--getting very far into the impact area by vehicle or on foot was difficult and dangerous. The volcano was still very active and unpredictable. Helicopters were the best option. Thus, as illustrated in Figure 8, the State DES then contacted the Air Force Rescue Coordination Center (AFRCC) at Scott Air Base near St. Louis, Missouri.** It in turn authorized the 3rd-5th cavalry at Fort Lewis and the 304th ARRS to respond to Lewis County and Cowlitz County, respectively. As noted earlier, this latter helicopter unit was already airborne at the request of the USFS.

During the same time, the Army National Guard helicopter team received word of the eruption at their annual training exercise near Yakima, Washington. They were already on alert for any problems with the caravan of property owners planning to enter the red zone. So as the ash started to fall on the Yakima Firing Range, 20 of the 32 helicopters were able to lift off in zero visibility and head toward Gray Field at Fort Lewis to refuel. A trio of helicopters then took off for Toutle where the leading edge of the action was taking place, according to the State Highway Patrol. The remaining helicopters went directly to Kelso airport to await further instructions.

Arriving at Toutle, the National Guard established a base camp at the baseball field. Various tasks, such as missing person reports, communications, evacuation, emergency medical care, and the media, were assigned. The first helicopter headed up the Toutle River Valley at approximately 1:30 p.m. The mission objective--to search for and rescue those caught in the flash flooding.

Kelso airport was used as a rear operations base where helicopters

*These as well as other interorganizational resource linkages are depicted in Figures 8, 9, and 10 by solid lines.

**Actually, the 304th made the call to the AFRRS themselves at the request of the State DES, thus modifying the "official" procedure somewhat.

would refuel and non-SAR missions, e.g., taking government officials, the media, and so on into the impact area, would originate.

Also landing at the Toutle base camps during this time were six helicopters from the 304th ARRS and one from the Coast Guard base in Astoria, Oregon. Earlier, the 304th was searching for David Johnston while the Coast Guard helicopter was checking for blockage in the Columbia and Cowlitz Rivers. Now, they arrived at Toutle at the request of the Cowlitz County Sheriff's Department. A sheriff's department deputy was present, but it was the National Guard unit that was independently organizing the missions--just as they had planned weeks earlier. Consequently, an uneasy, ill-defined alliance developed among the four organizations, with conflicting perceptions as to who was exactly in charge of the overall operation.

Nevertheless, over 20 helicopters began flights up and down the two forks of the Toutle River. The most immediate task was evacuating people along the riverbanks as the waters began to rise quickly. Reports of missing people also began coming in via the Cowlitz County Sheriff's Department. And helicopter crews began spotting evidence of victims--an overturned car here, a pickup truck halfway buried in mud over there. Although landing in the mud-ridden terrain was extremely dangerous, a number of pilots took the chance when someone was spotted alive and in danger.

Later this first day of the SAR mission, the impact area was divided into eight search sectors using the natural drainage systems as dividing lines--the first effort at coordinating the airspace around the mountain. Helicopter teams were assigned to search a particular sector. Yet, this objective was seriously thwarted by the multitude of private aircraft entering the area. Many of them were carrying media people, to the dismay of SAR personnel.

On the local level, as we see in Figure 8, both Cowlitz and Lewis counties activated their EOC's, located in Kelso and Chehalis, respectively. Manned by personnel from the sheriff's departments and county DES's, these two EOC's focused on meeting the many immediate needs of the local communities affected by the eruption--only one of which was search and rescue. For example, roadblocks had to be set up to keep sightseers out of the impact area and to divert traffic around the interstate over the Cowlitz River. This was accomplished by the county sheriff's departments and the State Highway Patrol.

Local communities had to be warned of the dangers of the ashfall and the possibility of flash flooding. In Cowlitz County, evacuation procedures were begun according to plan--shelters were established, volunteers contacted, and emergency supplies transported to these shelters. Assisting in this effort were the Salvation Army, the Red Cross, and Skamania County Sheriff's Department.*

In Lewis County, sheriff's department, USFS personnel, and local SAR volunteers began to mobilize to the southern parts of the county around Salkum, Packwood, and Randle. They began finding survivors who had walked out of the impact area injured, but alive and who told them of the catastrophic effects of the eruption--and about others still trying to get out. Completely independent of Cowlitz and Skamania counties, it was decided that a SAR operation would be needed. The request for the 3rd-5th Cavalry was then transmitted to the State DES.

At day's end, after 66.2 hours of helicopters flying, the results were added up--12 known dead, about 137 saved or evacuated by helicopter, and an unknown total still missing. And all of this was accomplished despite

*Since the major impact areas were to the west and north of the volcano, the Skamania County EOC purposefully was not activated although personnel were prepared to do so if necessary. Thus, the main role of the sheriff's department was to assist Cowlitz County in their evacuation efforts.

the ash-darkened skies, the dramatically changed topography, the crowded airspace, and the unpredictable volcano. Yet, SAR personnel knew that the mission had just begun.

Monday, May 19. The first full day of the SAR operation saw a growing and more complex multiorganizational system. The incredible events of the day before were by now common knowledge throughout the world. And the world media, not content to stay at the Vancouver ECC, began converging on the SAR operation in their eager quest to get the latest news. Thus, another set of demands were placed upon SAR personnel.

By this time, the ash had settled around the mountainside and the mud-filled torrents of water had found their way to the Columbia River, raising its channel depth from 45 to 14 feet. Yet, the threat of more destruction was ever-present. For geologists feared a volcano-born dam that was holding back the new Spirit Lake would not hold up. If the 200-foot high plug broke, an estimated 80 billion gallons of muddy water would once again roar down the Toutle and Cowlitz Rivers. Although it did not break, this impending threat was very real for those in the Kelso, Longview, and Castlerock areas. Emergency evacuation was begun on a standby basis.

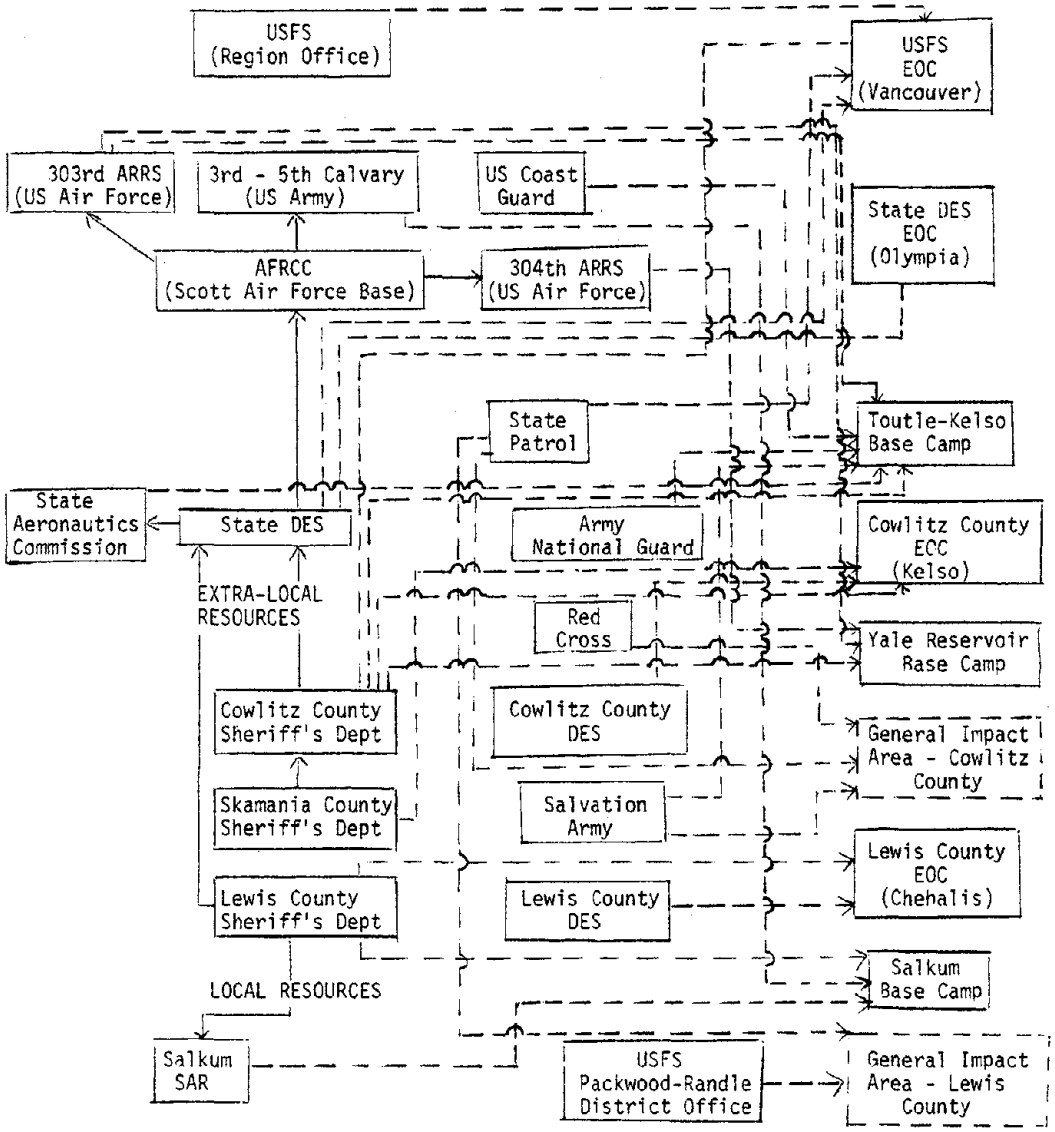
Turning to Figure 9, we see a more complicated response system. All four of the EOC's continued their respective operations with the same organizations. Two additional SAR base camps were established, however. Salkum was chosen as the headquarters for operations in Lewis County. It was close to the mountain and Chehalis, the county seat, yet outside the impact area. Sheriff's department personnel coordinated the activities, Salkum SAR provided the manpower, and the 3rd-5th Cavalry arrived with seven helicopters for air support. While attempts were made to get into the

FIGURE 9

MOUNT ST. HELENS

TRACING THE EMERGENT MULTIORGANIZATIONAL SYSTEM

MONDAY AND TUESDAY, MAY 19 AND 20, 1980



Interorganizational Resource Linkages

Mobilization

impact area on the ground, helicopter pilots were being oriented to the changed topography on the north side of the mountain. At the same time, they were on the lookout for any man-made objects which indicated a possibility of victims. Farther east,in Randle and Packwood, USFS rangers continued their assistance to the local communities in coordination with the Lewis County EOC.

Back at the Toutle-Kelso base camp, a number of decisions were made. The 304th ARRS would base their operations at the Yale Reservoir near Amboy and cover the southern sectors of the mountain. They routinely used the reservoir as a base camp for SAR missions in the past and could refuel there instead of at Kelso, where the amount of fuel was becoming critically low. Similarly, it was decided that the one Coast Guard helicopter would search the Columbia River for people unaware of continued flash flooding.

An underlying factor to these decisions, however, was what one of our respondents referred to as "organizational integrity". That is, given the uneasy interorganizational relations at the Toutle base camp during the previous day, establishing another base of operations and dividing up the search sectors would allow each military unit to control their own resources. Conflict over who would be the top SAR authority would be avoided for the time.

Nevertheless, the Cowlitz County Sheriff's department did try to gain overall control over the various SAR operations at Toutle-Kelso, Amboy, and Salkum. A basic problem was establishing a communication network among these base camps, the over 30 helicopters in the air, the numerous private aircraft filled with sightseers and the media, and the Vancouver and Olympia EOCs.

To help alleviate this situation, the interorganizational SAR system

was once again tapped for a unique and recently developed SAR resource. Requested through the State DES and the AFRCC, a C-130 carrying a specially designed communications jeep and members of the 303rd ARRS flew into Portland from March Air Force Base, California. The jeep is equipped to provide two-way communications on most radio frequencies as well as by an experimental ATS-3 satellite owned by the National Aeronautics and Space Administration (Lodato, 1980).

From Portland, the jeep was driven to Yale Reservoir while the C-130, also equipped with sophisticated communications gear, served as an airborne command post with the assistance of the State Aeronautics Commission. It could monitor the movements of up to 65 aircraft at one time. And, together with the experimental satellite technology, it could provide the vital communication linkages among the various organizations within the complex SAR system.

The coordination and authority problem, however, was not completely solved by this added technology. The National Guard, having already established their mode of operation at Toutle, were reluctant to operate under the direction of the Cowlitz County Sheriff's Department. Likewise, the Salkum base camp continued almost completely independent of the other two base camps. Communication between the 3rd-5th Cavalry helicopters and other helicopter teams was nearly non-existent.

Consequently, the SAR response continued to be hampered by a lack of complete control over the operation--resulting in some near mid-air collisions, an ambiguous authority structure, an unmanaged media, and a growing frustration for the various SAR officials. Something had to be done.

So it was that representatives from the three sheriff's deparments (Cowlitz, Skamania, and Lewis counties), the State DES, and the USFS met

Monday evening to tackle the problem. The five-agency team decided that "a joint effort be pulled together to coordinate and control, with documentation, the air and ground SAR missions" (Miller, et al., 1980:2). Yet, representatives from other SAR organizations--especially the National Guard-- were not involved in this decision-making process.

By the end of this first full day of the SAR response, over 200 aircraft hours involving 130 persons were logged. Another 29 saves were recorded. A few dead bodies had been located but not yet removed from the impact area for two reasons: 1) the primary mission objective was still the rescue of survivors; and 2) there was concern over legal ramifications of moving the dead without the presence of a coroner. Finally, the lists of missing persons continued to grow, indicating the job was far from being finished.

Tuesday, May 20. This third day of the SAR response saw a continuation of the various activities with a few exceptions. First, the National Guard helicopter unit moved back to Kelso airport. The possibility of the newly-formed dam at Spirit Lake failing was ever-present. With the threat of flash flooding, Toutle would no longer serve as a safe base camp. And little hope was left that survivors of the initial eruption were still in the impact area.

By late afternoon, all leads had been followed up at least once. All eight sectors had been searched and re-searched and, as one of our respondents termed it, were "closed and secure". Like a military mission into enemy territory, helicopters would fly up the Toutle river valleys, until they got to the assigned sector. Then they would "penetrate" up the middle of the sector and spread out to its fringes. Through this series of maneuvers, each sector would be systematically searched for any additional survivors as well as any indications of people--for example, cars, trucks,

campsites, and so on. Thus, at least for National Guard officials, with only one additional survivor found on Tuesday, the remaining SAR task was in all likelihood body recovery.

At the Salkum base camp, SAR personnel continued their attempts to get into the impact area by vehicle and on foot. Salkum SAR members hiked all the way to Ryan's Lake on their first ground mission. 3rd-5th helicopter pilots still found it difficult to land on the dry, powdery ash. They continued aerialsurveillance under the direction of the Lewis County Sheriff's Department but still not coordinated with the National Guard and 304th ARRS helicopters.

The Cowlitz County Sheriff's Department continued its attempts to gain overall control of the SAR operation from the Yale Reservoir base camp. The number of aircraft in the area was steadily increasing and search patterns were yet to be adequately coordinated among the various helicopter units. Particularly problematic in the eyes of the Cowlitz County Sheriff's Department was the lack of coordination with the National Guard. Asking the AFRRC and the State DES for help, a message was sent over the Emergency Services teletype:

> "Emergency Services will call headquarters of all units to reaffirm that sheriff is in charge of all SAR, and all units are in support of sheriff and must be tasked only by or in coordination with the sheriff's EOC" (The Oregonian, 1980: U32).

On the other hand, the viewpoint of the National Guard officials was reflected in the following paraphrase of one of our respondents:

> One of the things that I felt was important was that they let me do my job. I know my people and who can get into what areas, under what circumstances, and under what weather conditions.

Thus, as reflected in this statement, the National Guard wanted to maintain control over their own resources and did just that during this third day of the SAR response.

Later in the evening, representatives from the three county sheriff's departments and the USFS again met at the Cowlitz County EOC to discuss the problem.* They agreed upon a solution--to establish one central command port at Toledo Wednesday morning. The independent SAR operations at Kelso, Yale Reservoir, and Salkum would be pulled together under a joint decision-making team composed of a representative from each of the four agencies. Tasks were assigned that night. The USFS would be in charge of logistical information via their Vancouver EOC, Cowlitz County air search, Lewis County ground search, and Skamania County missing persons. Major decisions would be made jointly by all four agency representatives.

National Guard officers also began to act that evening, independent of the above plan. Based upon their own plans drawn up in April, they decided that Toledo would be the most logical site for a continued SAR operation. It was only 35 miles from Mount St. Helens yet, unlike Toutle and Kelso, was not in the potential flood areas. It also had an adequate airstrip and wasabout an hour's drive from Ft. Lewis, where refueling trucks and the National Guard EOC were located. By late Tuesday evening, their supply trucks began the trip from Kelso to Toledo.

At day's end, one additional survivor had been rescued. But a sizeable job remained--the recovery of 18 bodies that been located thus far and the search for the 85 people still listed as missing. As we shall see, such a task proved to be less than straightforward for SAR officials.

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*According to one of our reviewers, a National Guard representative was present at this meeting, but it is uncertain as to his role in the discussion.

Wednesday, May 21. The weather was poor during this fourth day of the SAR response. Rain and fog kept most aircraft on the ground; only 13 hours of flying time were logged. While the rotor blades remained idle, the base camp at the Toledo airport was humming with activity nevertheless. National Guardsmen began setting up what was to be SAR headquarters for the next eight days of the mission. The airport hanger served as a communication center. An area for briefing and debriefing pilots was designated so that flight assignments could be made in an organized fashion. Also, all information about victim locations could be recorded and communicated in one centralized location--or at least, that was the plan. Eventually, a tent city complete with sleeping quarters, mess area, and so on, was in place. About 200 persons per day from more than 20 organizations were to use their facilities during the next week (see Figure 10). Also, there were dozens of reporters from all over the world added to the total number of people at the small airport.

Amid all of these activities, SAR officials began confronting a most difficult task. For it is one thing to mobilize all of your SAR resources in one central location--and quite another to integrate them into a unified, multiorganizational system. It was at Toledo that this lesson was painfully learned under the scrutinizing eyes of the international media.

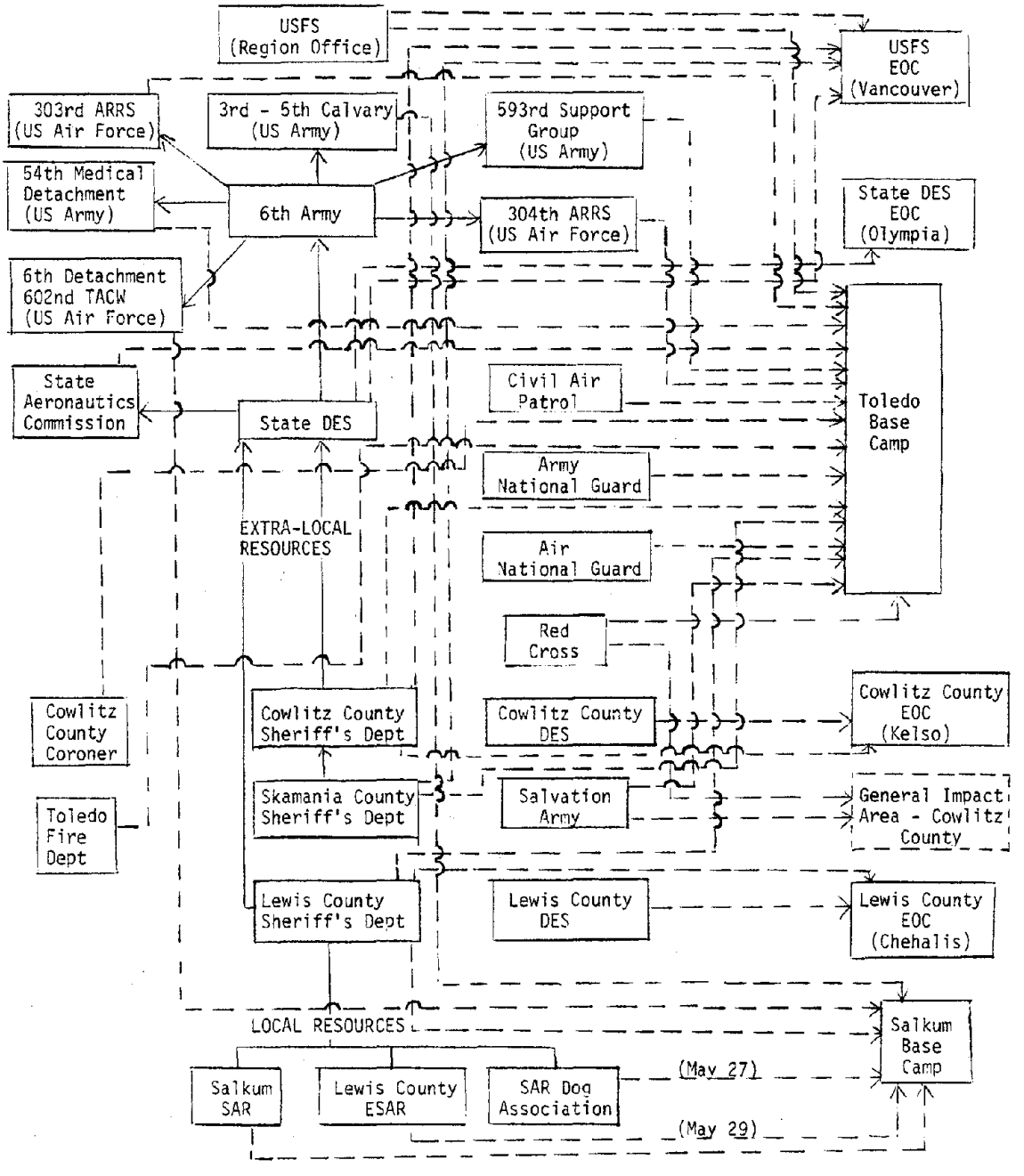
First, a confrontation emerged between the National Guard and the USFS and sheriff's departments. The issue-who was going to be in charge of the Toledo operation? National Guard officials argued that they had planned to use Toledo back in April, knew what sectors were already searched, and had the more detailed survivor's manifest, i.e., information on who had been rescued thus far, where bodies were located, and who was still missing. They had started setting up the base camp independent of other organizations and saw

FIGURE 10

MOUNT ST. HELENS

TRACING THE EMERGENT MULTIORGANIZATIONAL SYSTEM

WEDNESDAY AND THURSDAY, MAY 21 AND 22, 1980



little need to change their plans.

The USFS and the three county sheriff's departments representatives did not agree. From their point of view, it was the county sheriff who was in charge of SAR activities according to state law (see Chapter II). Given that legal authority and their decision to form a four-agency decision-making group for the remainder of the SAR response, they argued that the National Guard should support their efforts.

So, who was to be in charge? After some heated discussion, the National Guard did accede to the wishes of the four-agency group. Both the AFRCC and the State DES were supporting the legal authority of the county sheriffs and, as one of our respondents reasoned, the primary SAR objective of rescuing survivors from the impact area had in all probability been met. Thereafter, they reoriented their thinking and began to operate in closer cooperation with the USFS and sheriff's departments.

This process of negotiating an authority structure was not totally solved by this accomodation, however. For military officials from Ft. Lewis arrived at the Toledo base camp to assess the situation. Their involvement was in anticipation of a disaster declaration by President Carter later that day. Once such a declaration is made, any military resources are authorized to respond at the request of local and state officials. As illustrated in Figure 10, this request is channeled to the 6th Army rather than the AFRCC, in accordance with the national SAR plan. In addition, the Federal Emergency Management Agency (FEMA) becomes the lead agency for coordinating the total federal response.

As we discovered in the previous chapter, many of the military units from Ft. Lewis, (i.e., the 54th Medical Detachment, the 593rd Support Group, and the 6th Detachment, 602 TACW), had little previous contact with other

organizations in our sample. They were not a part of the multiorganizational system that responded to routine SAR missions in the state. Thus, there was little basis for shared expectations between these military units and those SAR organizations already at Toledo.

When these military commanders did arrive at the base camp Wednesday morning, they sensed a general confusion over who was in charge. And, "by nature of rank and authority" as one of our respondents noted, these high ranking officers were unaccustomed to responding to the authority of local county sheriffs. So the initial posture that they took was one that reflected the military as an organization. This posture is evidenced in the following paraphrases from one of our respondents:

> The military as an organization has a hierarchical structure in that the higher the rank you have, the more authority you have.
>
> One of the missions of our unit is to coordinate, command, and control any disaster situation.
>
> A basic premise, in my opinion, is that the man who has the most resources is in charge. You then cut out niches for everyone to do something and be satisfied.
>
> The sheriffs are novices, but we are not because we have the experience. The sheriffs were really under my control. We would advise them on what to do, and then they did it, thinking that they were actually making the decisions. It's a perfect example of the way things can occur.

On the other hand, the viewpoint of the USFS and sheriff's department representatives was again, that they were in charge by law. Military units were expected to respond to their direction, as is the case with routine SAR missions involving civilians.

What resulted was an indistinct authority structure involving the USFS, the three sheriff's departments, and at least two military units--as perceived by many of our respondents. And the numerous reporters who were watching

the Toledo base camp were taking note of the situation.

A third issue revolved around the State DES. "Where are they?" was a question in the minds of many at Toledo. As the key coordination agency in the state, why were they not the lead agency in clearing up the confusing authority structure? The answer--remember the discussion of this agency in the previous chapter? The State Coordinator of SAR was also made the manager of Emergency Preparedness and Operations. Role conflict ensued--was he, as the manager of the EOC in Olympia, to leave for Toledo while it was being flooded with demands from county agencies across the state, the media, and the general public? Or was he to go to Toledo and leave the Olympia operation to someone else not as familiar with various federal and state resources? His decision was to stay at the Olympia EOC. Even if he had gone to the base camp, it was unclear whether he had any authority to do anything more than negotiate a consensus among the various agencies.

Nevertheless, State DES personnel were stretched so thin that no one could be assigned to the SAR base camp on a continuing basis. There just were not enough people to meet all of the demands. But the expectations of SAR personnel at Toledo remained. Many of our respondents perceived the agency as having fallen short of its responsibilities.

And more problems continued to thwart the SAR operation, just as the steady rains continued to keep the helicopters grounded. One difficulty concerned the recovery of bodies. Up to this time, the primary objective of the SAR response was the rescue of survivors. Also, only a coroner can declare someone dead--at least legally. Thus, the bodies of deceased victims were left as they were found in the impact area.

Now the recovery of those bodies became the chief task of the SAR

mission, but both the 304th ARRS and the National Guard insisted that the new task be cleared with their superiors. As noted in Chapter II, military units can respond to civilian SAR missions only if a life or death situation exists. Body recovery is a different story. So the State DES was asked to help once again. They, in turn, called the AFRCC* which coordinated the use of the 304th and called the National Guard Bureau in Washington D.C. The Bureau then coordinated the Washington National Guard headquarters at Camp Murray (next to Ft. Lewis) to engage in body recovery in this special situation. The orders were then sent back through the State DES and to the Toledo base camp. At the same time, the Cowlitz County Coroner authorized some sheriff's department deputies to declare a victim dead in the impact area. Thus, through interorganizational cooperation, this one difficulty was resolved.

Intermingled with all of these problems were the media. Dozens flocked to Toledo from all over the country and the world, intent on getting first-hand news on the SAR operation. They were not about to stay at the Vancouver ECC for information as had been envisioned by the USFS contingency planners The confusion that reigned on Wednesday so preoccupied the SAR authorities that procedures to handle the press corps were not in place yet. Without a clear-cut authority structure, reporters were asking almost anyone what was happening. There was a public information officer (PIO) at Toledo, but his favoritism toward some of the press only made the situation worse. Throughout the day, this public relations breakdown only added to the frustration of both SAR officials and the media (see Lovell, 1980).

While all of these difficulties were being dealt with at Toledo, the Salkum base camp continued to operate under the direction of the Lewis County

*At this time, the 6th Army was not yet involved because the presidential disaster declaration had not yet been given.

Sheriff's Department. Now they were being told to clear their activities with the central command at Toledo. Seeing the confusion at Toledo, such a command did not sit well with them. So they resisted and continued their independent operation in the general area north of the mountain. After-the-fact reports were made to Toledo to eliminate unnecessary duplication of search areas.

The result was predictable--the world soon knew about the little airport at Toledo, Washington. And the SAR operation was not cast in a very favorable light (Lovell, 1980).

Last, but certainly not least, was a problem involving missing persons. Numerous agencies and EOC's had been compiling their own lists since Sunday without any sense of coordination. To what extent the information was accurate or complete varied from list to list--how many were rescued, found dead, still missing, and so on became one difficult piece of detective work. This situation created problems not only for the SAR mission itself, but also the media and the families, friends, and neighbors of the victims. With the Skamania County Sheriff's Department as the lead agency, the task of coordinating the various lists and checking their accuracy was begun.

In sum, this fourth day of the SAR response to Mount St. Helens was one of confusion and frustration for many of our respondents. The meshing together of a variety of local, state, and military organizations into one overall multiorganizational system was faced with a number of obstacles. And these obstacles had to be surmounted before a well-oiled operation would emerge. As we heard over and over again, the unabated rain was a blessing in disguise for those still wrestling with the consequences of nature's forces.

Thursday, May 22. By this time, all of the major SAR organizations had arrived at the Toledo base camp (see Figure 10) and were assigned their tasks

for the remainder of the operation. A multiorganizational system began to take shape. Representatives from the three sheriff's departments and the USFS began to be recognized as a four-person management team directing the operation. Military officers coordinated with this team for various tasks but continued to be in charge of their own resources. The 304th ARRS, the Army National Guard, the 54th Medical Detachment, and various Army helicopter units provided air rescue support. The 303rd ARRS, the State Aeronautics Commission, and the Air National Guard provided communications for the Toledo base camp. And the Civil Air Patrol, under the direction of the Cowlitz County Sheriff's Department, coordinated the air operation.

Together with a representative from the USFS, personnal from the Ft. Lewis public information office were called in to establish a mechanism for dealing with the media. A specific press area was set up at the Toledo airport, briefings were given on a regular basis, tours of the base camp were conducted four to five times a day, and a list was make for up to 250 reporters who wanted to ride in helicopters into the impact area. Everyone was thus treated equally in terms of access to information--at least that was the perception of one of our respondents. The Cowlitz County Coroner was in charge of the temporary morgue and body identification; the Red Cross and Salvation Army provided food and shelter; and the Toledo Fire Department hosed off the ash from incoming helicopters. Not included in Figure 10 are the townspeople of Toledo who greatly assisted the SAR personnel through their many donations and warm hospitality.

At Salkum, the Lewis County Sheriff's Department, the 3rd-5th Cavalry, the 6th Detachment, 602nd TACW, and Salkum SAR continued to search the the northern side of the volcano. Up to ten helicopters flew about four to five missions a day, using a "low bird/high bird" system, i.e., one helicopter

would land on the ground while the other stayed airborne to watch for any signs of danger from the weather and the volcano.

It was on this day that these helicopters began to land in the impact area. For the previous day's rain had wetted down the ash and kept it from flying into the air as a helicopter approached the ground. Eventually, Lewis County ESAR (May 29) and the SAR Dog Association (May 27; see Doran, 1980) would add their specialized resources to the mission at Salkum.

Coordination between Toledo and Salkum improved, but still remained less than desirable. In retrospect, many of our respondents would have merged the two base camps if the problems of the previous day had been avoided. Such was not the case, however.

Finally, the EOC's at Vancouver, Olympia, Chehalis, and Kelso continued to respond to the requests of the media, county agencies, impacted communities, and the general public. And FEMA began setting up their headquarters in Vancouver to coordinate federal disaster relief efforts in response to the presidential disaster declaration (Lodato, 1980).*

Thus, the task of body recovery finally began this fifth day of the SAR operation. By day's end, over 60 aircraft hours were flown to locate and recover those bodies seen during the previous four days, and to search for those still missing. For most, the cause of death was asphyxiation by ash inhalation (The Oregonian: U38-39).

Friday, May 23 to Sunday, June 1. The remaining ten days of the SAR response continued in the same general mode that emerged on the previous day. Coordination among the various organizations continued to increase, and procedures became more systematic. The problems of authority, the media, and missing persons lists lessened as a set of shared expectations emerged among the SAR authorities. The search for and recovery of the remaining bodies was

*Of particular interest was the establishment of the Mount St. Helens Technical Information Network to inform the public and local officials on how to cope with the volcano's impact (see Kerr, 1980, 1981).

the primary task. Some additional "rescues" were necessary, however, due to a few individuals entering the impact area illegally .

An additional problem arose on Sunday, May 25, when a second ashfall blanketed the area. This made it difficult for SAR personnel to detect their previous markings that indicated which areas had already been searched. But with the more organized operation, this problem was overcome quickly.

By Thursday, May 29, the total impact area had been searched eight to nine times over. All leads had been followed up and all located bodies recovered. SAR officials at Toledo were faced with a major decision once again. Should they continue to search for the 58 people still missing and risk possible injury or death to already overworked SAR personnel? Or should they halt the operation, despite the urgings of the families and friends of those still unaccounted for? After some discussion, a consensus emerged--the Toledo operation would be halted. The search would continue on a case-by-case basis under the direction of the Cowlitz County Sheriff's Department as new information was received over the following weeks and months.

Similarly, the Salkum base camp disbanded on Sunday, June 1, after following up the last of their leads. Additional missions would be organized under the authority of the Lewis County Sheriff's Department as the situation warranted them. It was time to go home.

The Results. Tallying up the total results of the SAR response reveals the magnitude of the operation--600 square miles searched eight to nine times over; at least 600 sorties flown, consuming over 1,000 aircraft hours; over 2,000 personnel contributing more than 20,000 man-hours; and $114,000 in fuel costs alone (Miller et al., 1980). And these figures can be considered conservative, given the complexity of the overall response.

During the following weeks, the AFRCC at Scott Air Force Base would credit 61 saves to the 304th ARRS, 28 to the Washington National Guard, six to the U.S. Coast Guard, four to the U.S. Army, and one to the Civil Air Patrol-Washington Wing (Miller et al., 1980). Thirty-four bodies were recovered and another nineteen are missing and presumed dead. Still missing are eight other people (The Oregonian, 1980), bringing the dead and missing list to a total of 61.*

Without a doubt, for those people who participated in this SAR response, those 14 days in May 1980, was the MISSION OF A LIFETIME!

Coping with the Ashfall: Eastern Washington's SAR Response

While the drama of the SAR response in Lewis, Cowlitz, and Skamania counties captured the attention of the worldwide media, another story was unfolding in the eastern plains of Washington State. For Mount St. Helens did not exempt those east of the Cascade Mountains from knowing of her awesome power.

Without any warning, a gloomy cloud of ash darkened the Sunday morning skies. Visibility was zero. Tons of the finely pulverized rock showered the surrounding countryside, turning it into a dullish gray. In the Moses Lake-Ritzville area, up to four inches accumulated in a matter of hours. Like their western neighbors, thousands of eastern Washington residents now faced an unfamiliar and unexpected hazard.

How did these people respond to the ash? Was there any need for SAR activities? In order to answer these questions, we interviewed

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*As is common following large-scale disasters, various agencies have released slightly different figures for the dead and missing due to differences in the date of issue, political boundary, and the like. The figure of 60 deaths is the official record of the Cowlitz County Sheriff's Department as of April, 1981.

representatives from nine emergency response agencies in the Moses Lake-Ritzville area, which received a substantial ash fallout. We discovered that, yes, there was a large set of SAR demands placed upon these towns--demands quite unique from those of more common natural disasters. And these demands exacted a truly innovative response from the local populace.

When the ash cloud started descending on Moses Lake and Ritzville around noon, May 18, it caught most by surprise. There was no general fore-warning. State DES did issue a precautionary message over its teletype system, but it was perceived as vague and of little use for coping with the ash itself. The major SAR task became evident immediately--thousands of motorists were stranded along the ash-covered highways. Visibility was zero. Traction was poor. And worst of all, engines became clogged up with the gray powder, quickly disabling the cars of those who tried to escape.

Not many did. It was estimated by one of our respondents that more than 8,000* people were stranded in Grant and Adams counties alone. The population of Ritzville more than doubled from its normal 1,800 residents. And those residents faced no small challenge. For such figures easily match, if not surpass, those of most large-scale disasters in the United States.

Various law enforcement agencies responded as soon as possible, escorting those cars that were still running into town and transporting other stranded motorists by car, bus, and other available vehicles. Yet,

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*It is difficult to determine how reliable these figures are, and should be considered rough estimates only. We received a number of different estimates on the total number of stranded motorists, some of which differ from those reported in local newspapers. All are in the thousands, however.

these patrol cars soon began to fail, afflicted by the same problems of ash clogging the engines. Out of the ten cars of the Adams County Sheriff's Department, for example, only two remained operative after the first few hours. Similarly, only two out of twenty-five law enforcement vehicles in Moses Lake kept running through the first two days. Nevertheless, by Sunday evening, almost all the stranded motorists were off the road.

Where did they go? This was the second task. At the CCD Center in Moses Lake, almost 600 people were sheltered for two nights. Others stranded in Grant County were put up at Big Bend Community College, the Federal Building, and a multitude of motels, campers, and private homes. In Adams County, seven churches and two schools were set up as shelters for the estimated 2,800 visitors. Not expecting much outside help, local residents responded with donations of food until grocery trucks were able to roll into town. Fire departments transported food, blankets, and medical supplies as well as responding to a few emergencies, e.g., a woman in labor, another needing dialysis.

With this huge influx of people and the peculiar nature of the situation, special orders were given to maintain order. Major highways were closed to all but emergency traffic. Speed limits were reduced to 15 miles per hour in town to minimize the ash disturbance. And liquor was banned from sale after 8:00 p.m. in some of the towns. These and other messages were broadcasted throughout the area over commercial television and radio.

Finally, the task of transporting the unexpected visitors out of the area was approached in a number of ways. In Adams County, the regular Chicago to Seattle Amtrak train made special stops in Ritzville, Lind, and Schrag, picking up over 100 people along the way. Unfortunately, there just was not enough room on the train for everyone.

Other stranded motorists were organized into caravans on Tuesday, Wednesday, and Thursday. Escorted by water trucks which wetted down the ash, these caravans slowly made their way out of the ash-impacted area.

By Sunday, May 25, all of the stranded motorists had left, never to forget the brief and strange interruption in their travels of May, 1980. Never will they forget the hospitality of those remaining in the towns of Moses Lake and Ritzville.

And the Next Eruption?

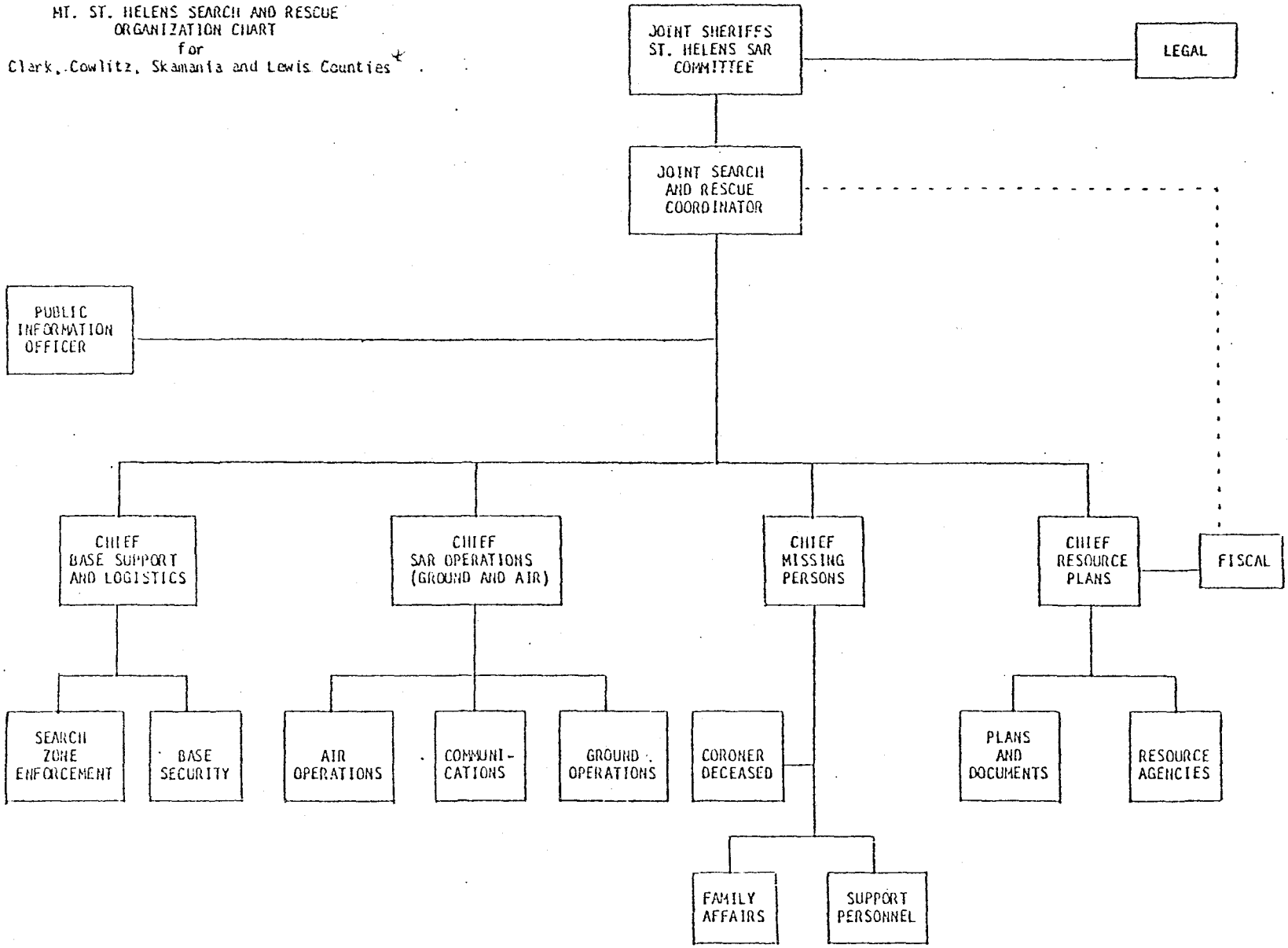
Unlike other types of natural disasters, a volcano can present a continuing threat to life and property once it becomes active. When Mount St. Helens was last active in the mid-1800's, its eruptive period lasted about 25 years (Crandell and Mullineaux, 1978). Thus, major eruptions like the one on May 18, 1980, may occur.

It is to the credit of SAR authorities in the State of Washington that this fact was taken very seriously. Soon after the Toledo and Salkum base camps closed down, an evaluation of the SAR operation began. An interorganizational critique was held in Kelso on June 6--only five days after the last SAR personnel left the impact area. The result--a more refined and detailed plan specifically geared toward a multijurisdictional SAR operation in response to any other major eruptions (Miller et al., 1980). Its purpose is stated succinctly:

> The purpose of this plan is to define the organization that evolved out of that operation (at Toledo) and refine areas which were identified in subsequent interagency critiques so as to provide a framework to deal with future SAR missions (p. 1).

Included in the written plan is a well-defined organizational chart (see Figure 11) accompanied by written descriptions of the various

MT. ST. HELENS SEARCH AND RESCUE
ORGANIZATION CHART
for
Clark, Cowlitz, Skamania and Lewis Counties*



*From Miller et al., 1980:6.

positions, i.e., Joint Sheriffs St. Helens SAR Committee, Joint Search and Rescue Coordinator, Public Information Officer, Chief-Base Support and Logistics, Chief-SAR Operation (Ground, Air and Communications), Chief-Missing Persons, and Chief-Resource Plans. Up to 13 pages of forms are also included in the plan to routinize and centralize incoming information on missing persons and air searches. Finally, an updated report on possible future impacts of the volcano and an emergency action plan by Pacific Power and Light can be found in appendices to the document.

Whether or not this plan is ever implemented in the future, we find it uniquely significant for a number of reasons. Unlike our previous case studies of disasters in Kansas, Texas, Mississippi, and Wyoming, we find a serious effort to remedy the problems of the SAR response so that they will not reoccur in the future. A more thoroughly defined authority structure is presented; the missing persons task is routinized; a multijurisdictional operation among all four counties is recognized and agreed upon; interorganizational linkages are specified; a public information officer to deal with the media is established; and resources are listed. Thus, it appears that the lessons learned during those fateful days in May were learned well. Hopefully, there will be not need in the future to discover how well.

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*Please refer to the back page for a listing of the technical reports on each of these case studies.

CHAPTER V

THE EMERGENT MULTIORGANIZATIONAL SAR SYSTEM

Search and rescue is a multiorganizational enterprise. It took a multitude of organizations to meet the SAR demands generated by the May 18, 1980, eruption of Mount St. Helens. Those organizations did not respond individually, but rather joined together to establish one overall system. And the essense of that system--the "glue" that held it together--is interorganizational linkages.

In this chapter, we want to expand on the descriptive material presented in the previous pages by analyzing some data on three types of interorganizational linkages--communication, coordination, and authority. Each of these processes were critical to the functioning of the overall SAR system.

This system did not appear all of a sudden, however, but rather emerged and changed over a period of 14 days. Organizations entered and left the system at different times. SAR demands, roles, and tasks changed. Interorganizational linkages became established at different points in time. Thus, assessing the dynamic quality of the system provides a more precise picture of the complexity of the SAR operation.

Finally, we were interested in gaining some sense of the effectiveness of the SAR response as perceived by our respondents. And we wanted to measure such perceptions at different points in time.

How did we gather this interorganizational data? It was no easy task. Following the methodology of Rogers (1974) and Hall et al. (1977), we devised a fairly complicated research technique. First, a representative from each of the sampled organizations was asked about his perceptions concerning communication and coordination between his organization and each of the others in the sample. He was also asked about his perceptions in the

chain-of-command, or authority structure, and how effective each organization performed their SAR-related tasks.

These data were then arranged in a matrix (for example, see Table 12). In order to better analyze each matrix, we subdivided it into five groups: 1) the USFS; 2) the State DES; 3) organizations responding primarily in Cowlitz County and/or at the Toledo base camp; 4) organizations responding primarily in Lewis County and/or at the Salkum base camp; and 5) the Red Cross and Salvation Army.

To capture the emergent process of the multiorganizational system, we divided the 14 days of the SAR response into three time periods that reflect the different stages to the operation: 1)Sunday and Monday, May 18-19; 2) Tuesday through Friday, May 20-23; and 3) Saturday through Sunday, May 24-June 1. In this way, data were gathered on communication, coordination, authority, and effectiveness for each of the three time periods.

What we have ended up with is an admittedly crude, yet useful picture of some critical processes of the SAR system at three different points in time--analogous to three sequential snapshots of a moving target. These data reflect the perceptions of organizational representatives most involved in the SAR activities and thus can be subject to an unknown degree of distortion. So as we examine these more quantified data, let us keep in mind the more descriptive material presented in the previous chapter. We can then compare the two sets of data and determine to what extent they complement each other.

Sunday and Monday, May 18-19

It was during these first two days that SAR organizations performed the bulk of lifesaving rescues. Four EOC's became operational and three base camps set up. The USFS was at their ECC in Vancouver; the State DES was at

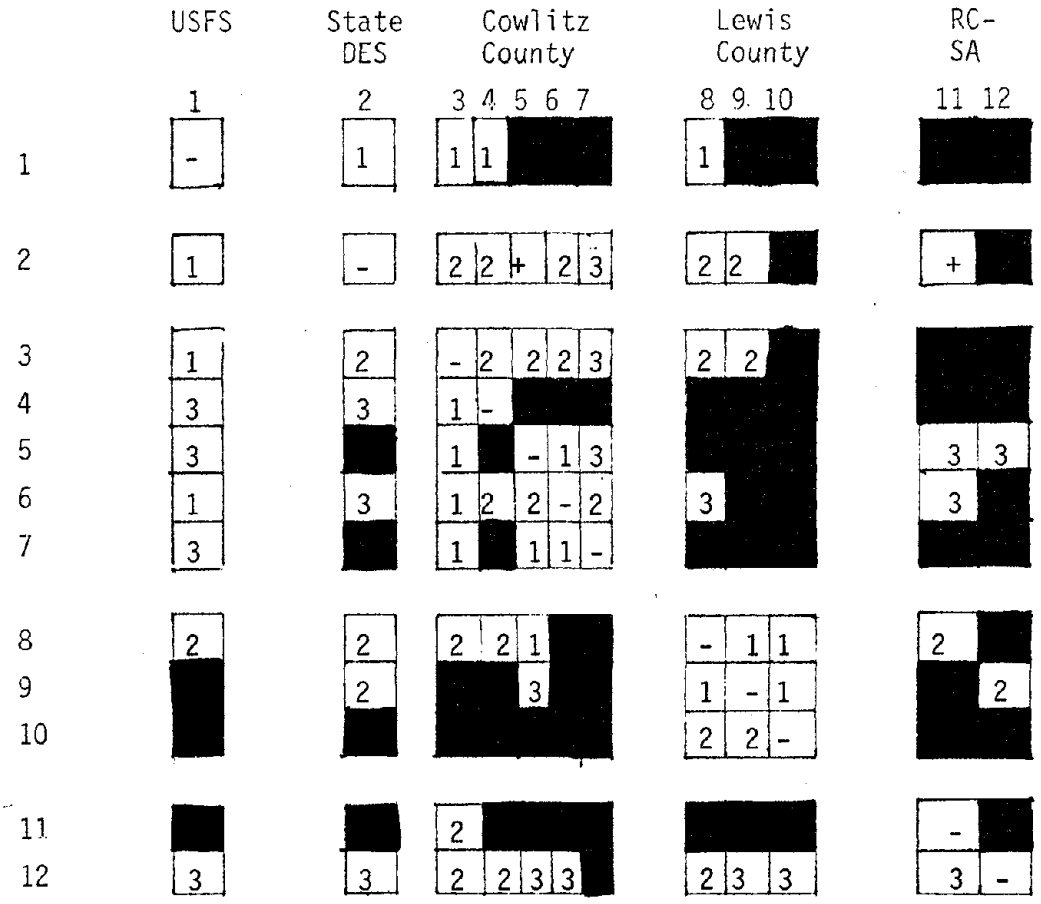
their EOC in Olympia; the Cowlitz and Skamania Sheriff's Departments, the Army National Guard, the 304th ARRS, and the U.S. Coast Guard were operating from the Toutle and Amboy base camps in Cowlitz County; the Lewis County Sheriff's Department, the 3rd-5th Cavalry, and Salkum SAR were setting up the Salkum base camp in Lewis County; and the Red Cross and Salvation Army were responding to a variety of needs in both counties. The difficult task of linking these organizations together into one overall system began soon after the volcano spewed forth its destruction.

How did our respondents view this process during this first time period? In terms of communication, we see in Figure 12 that a total of 66 linkages were formed among the 12 organizations. The system density, therefore, was 51%.* Thus, of the total number of linkages that could have existed, roughly one-half actually did. Of these, 15% involved "continuous" communication, 21% "about once an hour to every few hours", and 15% "about once a day or less." Of the possible linkages not formed, 39% involved the Red Cross or Salvation Army. Given the large number of evacuees these two agencies had to attend to first, such a lack of integration into the SAR network is not surprising.

A more important finding can be found in the four more central blocks of the Figure 12 matrix. Here, we see that among the organizations in the Cowlitz County group as well as the Lewis County group, the great majority of possible linkages were actually formed (75% and 100% respectively). Yet, communication between the two groups was much less--only 7 out of 30 (23%) possible linkages existed during these first two days of the SAR response. Thus, the perception that these two county operations were operating fairly independent of each other is supported by these data.

*Density was calculated by adding up the total number of linkages formed (66) and dividing by the total number possible minus the "+'s" (130); thus, 66/130 = 51%.

FIGURE 12
MOUNT ST. HELENS SAR RESPONSE
SUNDAY AND MONDAY, MAY 18-19, 1980
INTERORGANIZATIONAL COMMUNICATIONS*



1 = continuously
2 = about once an hour to every few hours
3 = about once a day or less
■ = no communication

15% (19)
21% (27)
15% (20)
49% (64)
100% (130)

Density = 51%

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. U.S. Coast Guard
8. Lewis County Sheriff's Dept.
9. 3rd-5th Cavalry (USA)
10. Salkum SAR
11. Red Cross
12. Salvation Army

*Each respondent was asked, "During this time period, how often was there direct communication between your organization and each of the other organizations?"

+At State DES EOC only.

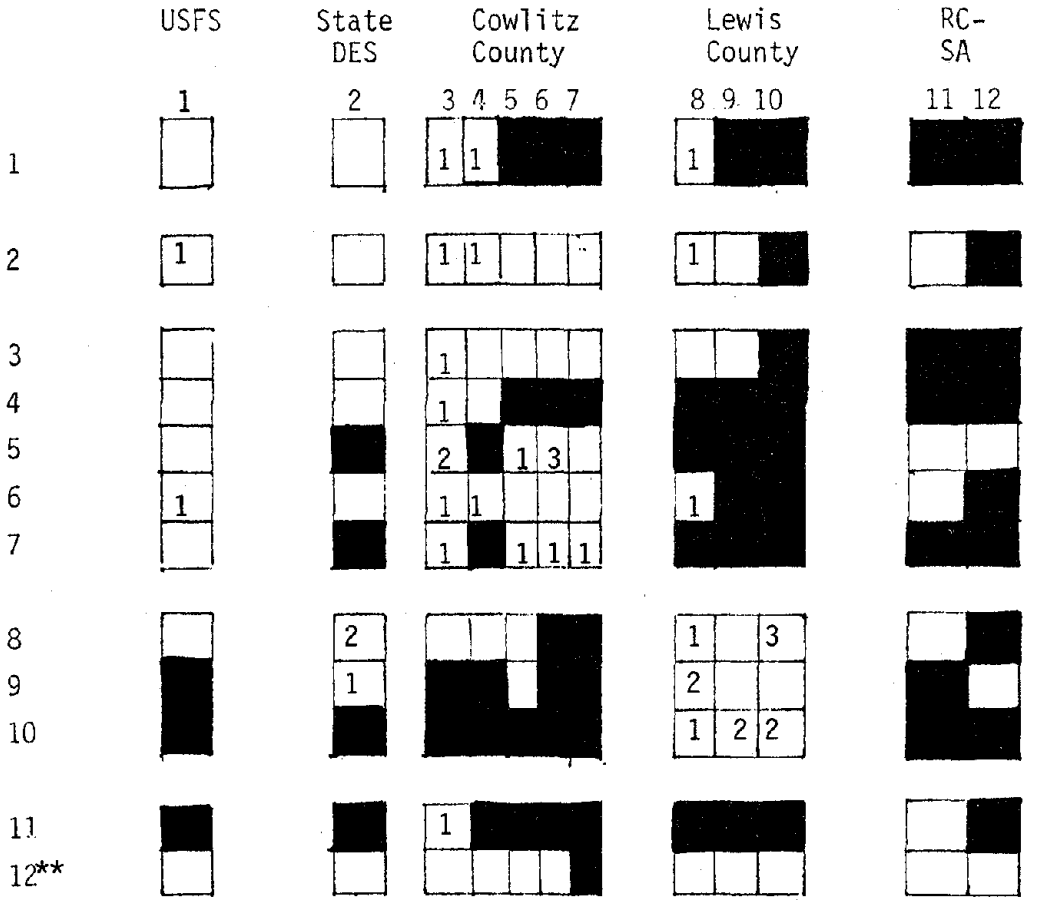
This latter conclusion is also evident in the data presented in Figure 13. When asked about an overall chain of command for the SAR operation, our respondents perceived two distinct structures. In Cowlitz County, the majority of respondents viewed the sheriff's department as the top authority, followed by the Skamania County Sheriff's Department, the Army National Guard, the 304th ARRS, and the U.S. Coast Guard. Note, however, the number one rating the Army National Guard gave itself and the sole number two rating it gave the sheriff's department. Clearly, this is a different point of view, the results of which were discussed in the last chapter.

In Lewis County, there was less disagreement. The county sheriff was in charge, followed by Salkum SAR and the 3rd-5th Cavalry. The USFS and the State DES were given only two rankings each, although these did place them right behind the three county sheriff's departments in the overall ranking.

Interorganizational coordination during these first two days was viewed as low between the two county response groups (see Figure 14). Of the seven ratings given, one was "very well organized", and four were "slightly or not organized". Within the Cowlitz County group, a significant number (7) of the latter two ratings also appeared, signifying some coordination difficulties among those five agencies.

Nevertheless, more than one-half (58%) of the total linkages within the system were perceived as "very well organized" while 42% were less so. An even higher percentage of positive ratings (76%) are evident in the data on organizational effectiveness, as seen in Table 15. The only "fairly well to poor" ratings, interestingly enough, were given to the USFS, the state DES, Cowlitz and Skamania Sheriff's Departments, and the Army National Guard. Let's see how these data change for the next time period.

FIGURE 13
MOUNT ST. HELENS SAR RESPONSE
SUNDAY AND MONDAY, MAY 18-19, 1980
INTERORGANIZATIONAL AUTHORITY STRUCTURE*



■ = no communication

Organizations:

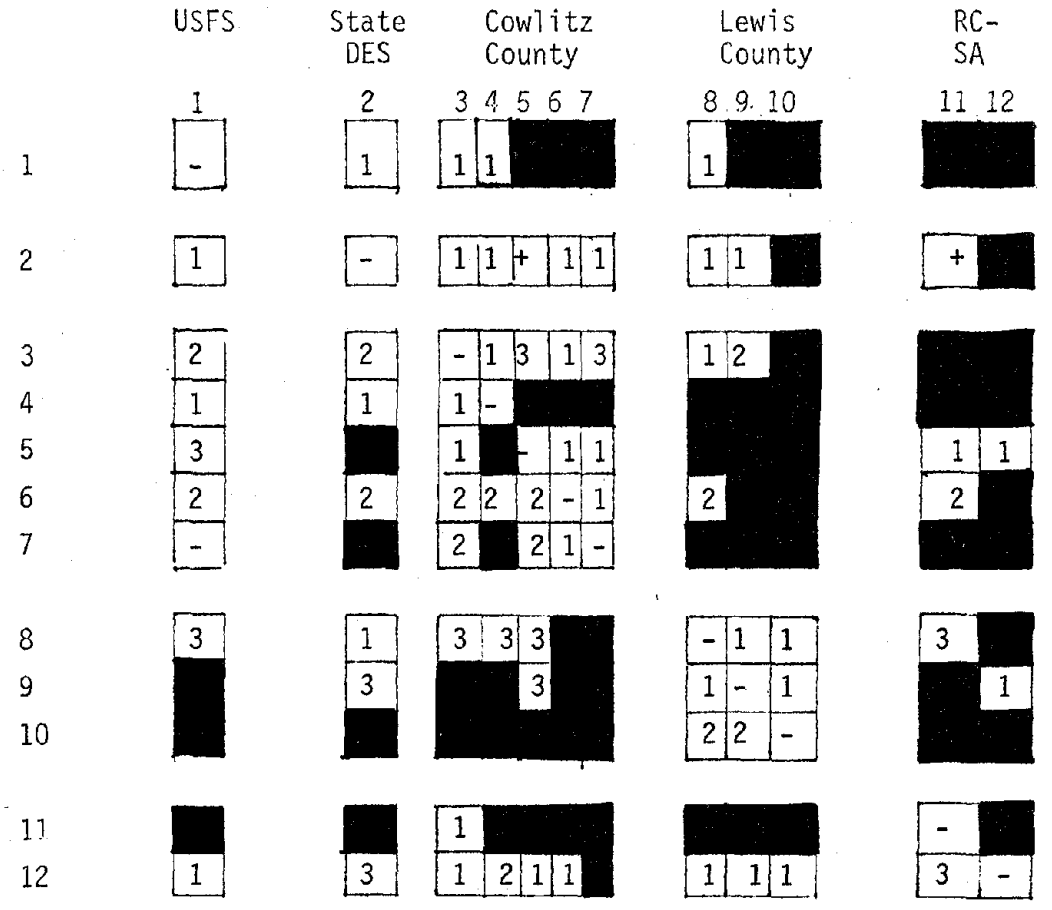
1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. U.S. Coast Guard
8. Lewis County Sheriff's Dept.
9. 3rd-5th Cavalry (USA)
10. Salkum SAR
11. Red Cross
12. Salvation Army

*Each respondent was asked, "Was there an overall chain of command among the organizations in the area where search and rescue operations were carried on? If yes, rank in order the organizations in the chain of command. More than one may receive the same ranking; name your organizations if appropriate.

**Did not perceive any chain of command during this time period.

***Ranks were calculated by: 1)converting any score of "1" to "3" and any "3" "1"; 2)adding the total scores of each column; 3)dividing by 11 (the total number of possible scores); and 4) ranking the resultant numbers from the highest to the lowest.

FIGURE 14
MOUNT ST. HELENS SAR RESPONSE
SUNDAY AND MONDAY, MAY 18-19, 1980
INTERORGANIZATIONAL COORDINATION*



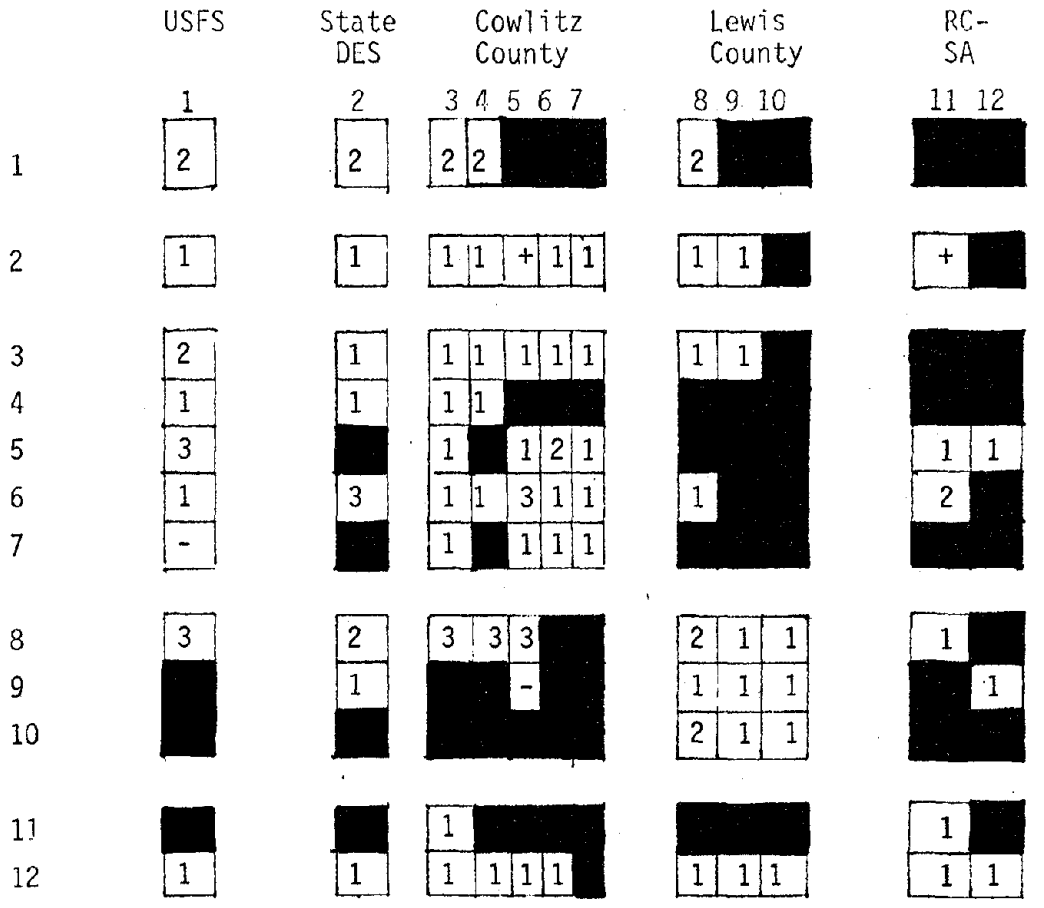
1 = very well organized — 58% (38)
2 = somewhat organized — 23% (15)
3 = slightly or not organized — 19% (12)
■ = no communication — 100% (65)
(64)

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. U.S. Coast Guard
8. Lewis County Sheriff's Dept.
9. 3rd-5th Cavalry (USA)
10. Salkum SAR
11. Red Cross
12. Salvation Army

*Each respondent was asked, "How well organized were the search and rescue activities of your organization and each of the others (meaning that these organizations worked together in a coordinated way)?"
+At State DES EOC only.

FIGURE 15
MOUNT ST. HELENS SAR RESPONSE
SUNDAY AND MONDAY, MAY 18-19, 1980
ORGANIZATIONAL EFFECTIVENESS*



1 = very well — 76% (58)
2 = well — 15% (11)
3 = fairly well to poor — 9% (7)
100% (76)
(64)

■ = no communication

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. U.S. Coast Guard
8. Lewis County Sheriff's Dept.
9. 3rd-5th Cavalry (USA)
10. Salkum SAR
11. Red Cross
12. Salvation Army

*Each respondent was asked, "How well did each organization carry out its search and rescue-related tasks during this time period (include your organization)?"

+At State DES EOC only.

Tuesday Through Friday, May 20-23

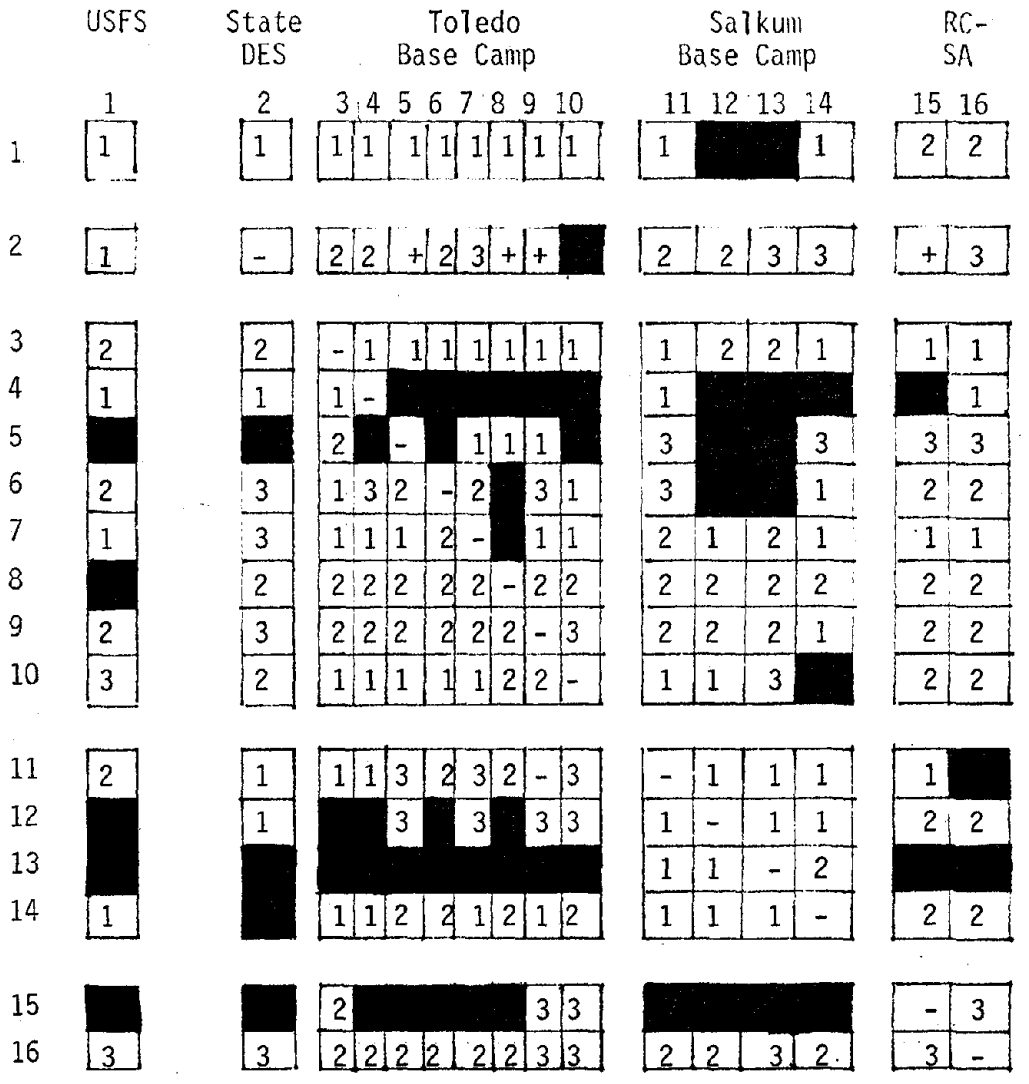
It was at the beginning of this second period that a major effort was made to establish system-wide control and coordination under the joint leadership of the three county sheriff's departments and the USFS. While the majority of SAR organizations began operating out of the Toledo base camp, a few remained at the already established Salkum base camp. All EOC's continued to operate in the same mode as the previous two days.

Five additional organizations from our sample, i.e., the 54th Medical Detachment, the Air National Guard, the Civil Air Patrol, the Cowlitz County Coroner and the 6th Detachment, 602 TACW, joined the SAR effort during this time while one, the U.S. Coast Guard, ended its involvement on Monday.

Turning to Figure 16, we see that interorganizational communication has increased significantly in comparison to the first time period. This increase can be seen in the lower percentage of "no communication" (24% compared to 49%) as well as the higher frequency of communication (31% compared to 15% "continuous" and 31% compared to 21% "about once an hour to every few hours"). If nothing else, personnel from different agencies were talking with each other. A total system density of 74% (up from 51%) attests to this conclusion.

We see the Red Cross and Salvation Army more integrated into the overall system with only 27% share of the total non-linkages. We also find a much higher number of communication linkages (69%) between the two base camps as well as a higher frequency of communication (35% "continuous"). The same findings also hold true for communication among the organizations within the two groups (80% and 100% of possible linkages formed within Toledo and Salkum base camps, respectively).

FIGURE 16
MOUNT ST. HELENS SAR RESPONSE
TUESDAY THROUGH FRIDAY, MAY 20-23, 1980
INTERORGANIZATIONAL COMMUNICATIONS*



1 = continuously
2 = about once an hour to every few hours
3 = about once a day or less
■ = no communication

31% (73)
31% (73)
14% (33)
24% (56)
100% (235)

Density = 74%

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment (USA)
8. Air National Guard
9. Civil Air Patrol
10. Cowlitz County Coroner
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Red Cross
16. Salvation Army

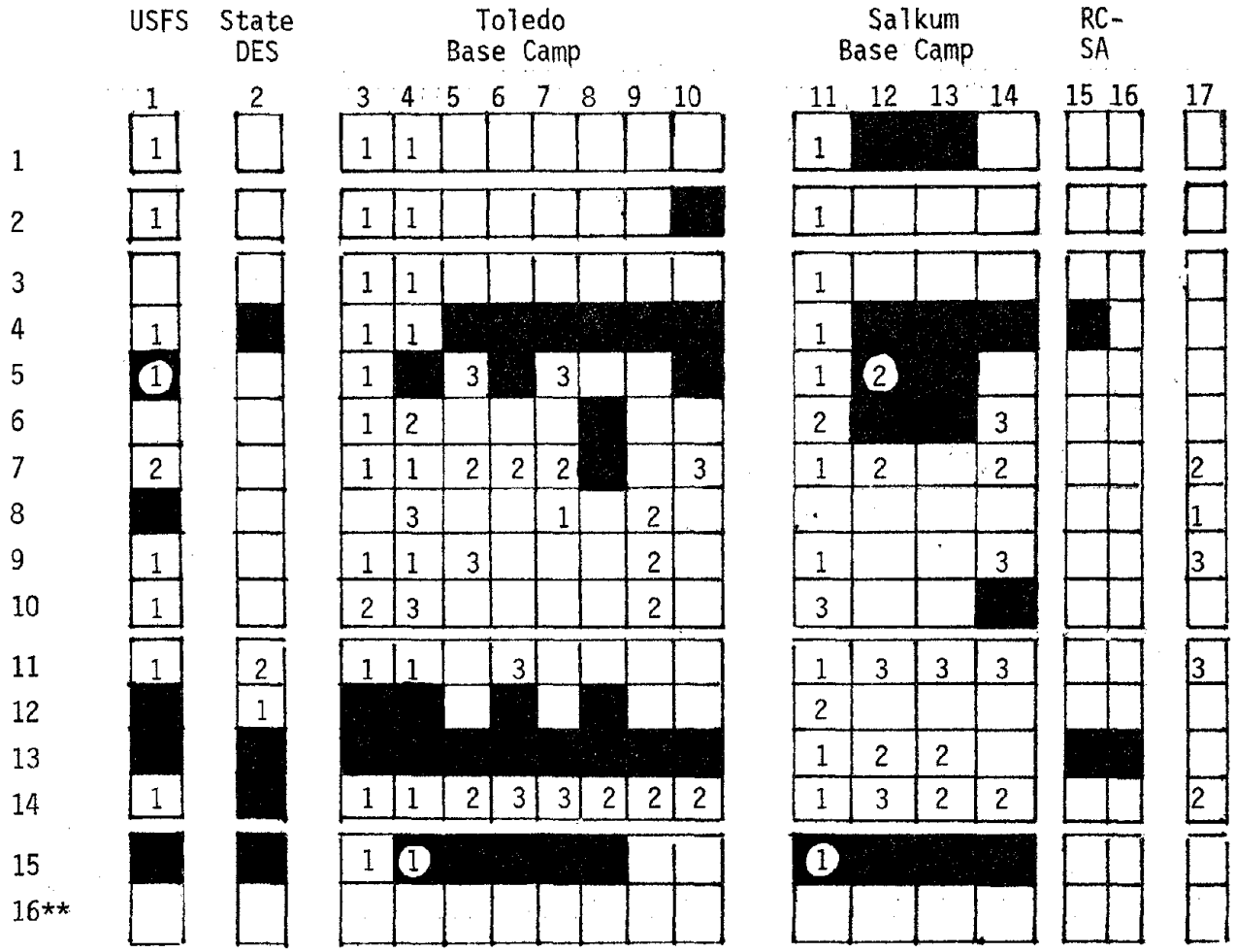
*See Figure 12.
+See Figure 12.

There still appears to be two authority structures during these next four days (see Figure 17), although there is much more of a tendency for respondents at Toledo to include organizations at the Salkum base camp in the rankings and vice-versa. Overall rankings reveal that the three sheriff's departments and the USFS are at the top of the authority structure, followed by a variety of military organizations, i.e., the 593rd Support Group, the 3rd-5th Cavalry, the 54th Medical Detachment, and so on. The Army National Guard has recognized this authority structure by this time and has dropped down in the rankings from a rank of four to a rank of nine. There is no strong perception that anyone saw the military as being in charge, as indicated by some of our more descriptive data in the previous chapter. Finally, the State DES also is not viewed as having much involvement in directing the operation, given a rank of 10 out of 13.

Interorganizational coordination improved in comparison with the last time period, as 65% of the linkages were perceived as "very well organized" (see Figure 18). Another 27% were rated "somewhat organized" while only 8% were "slightly or not organized". For this latter rating, a disproportionate share (3) was each given to the State DES, the Civil Air Patrol, and the Cowlitz County Coroner. Lastly, coordination between the two base camps appears to have improved, especially among the principal SAR responders.

Our last set of data for this second time period indicates this same positive trend, although not as strongly. As seen in Figure 19, 78% of the ratings on organizational effectiveness were "very well"--up two percentage points from the first two days. Disproportionate shares (3) of the lowest rating, "fairly well to poor", were each given to the State DES and the Civil Air Patrol--a finding echoing the data on coordination with these two agencies.

FIGURE 17
MOUNT ST. HELENS SAR RESPONSE
TUESDAY THROUGH FRIDAY, MAY 20-23, 1980
INTERORGANIZATIONAL AUTHORITY STRUCTURE*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Overall Rank***	4	10	2	3	9	11	7	13	6	12	1	6	10	8	0	0	5
Group Rank	-	-	1	2	6	7	5	9	4	8	1	2	4	3	-	-	3

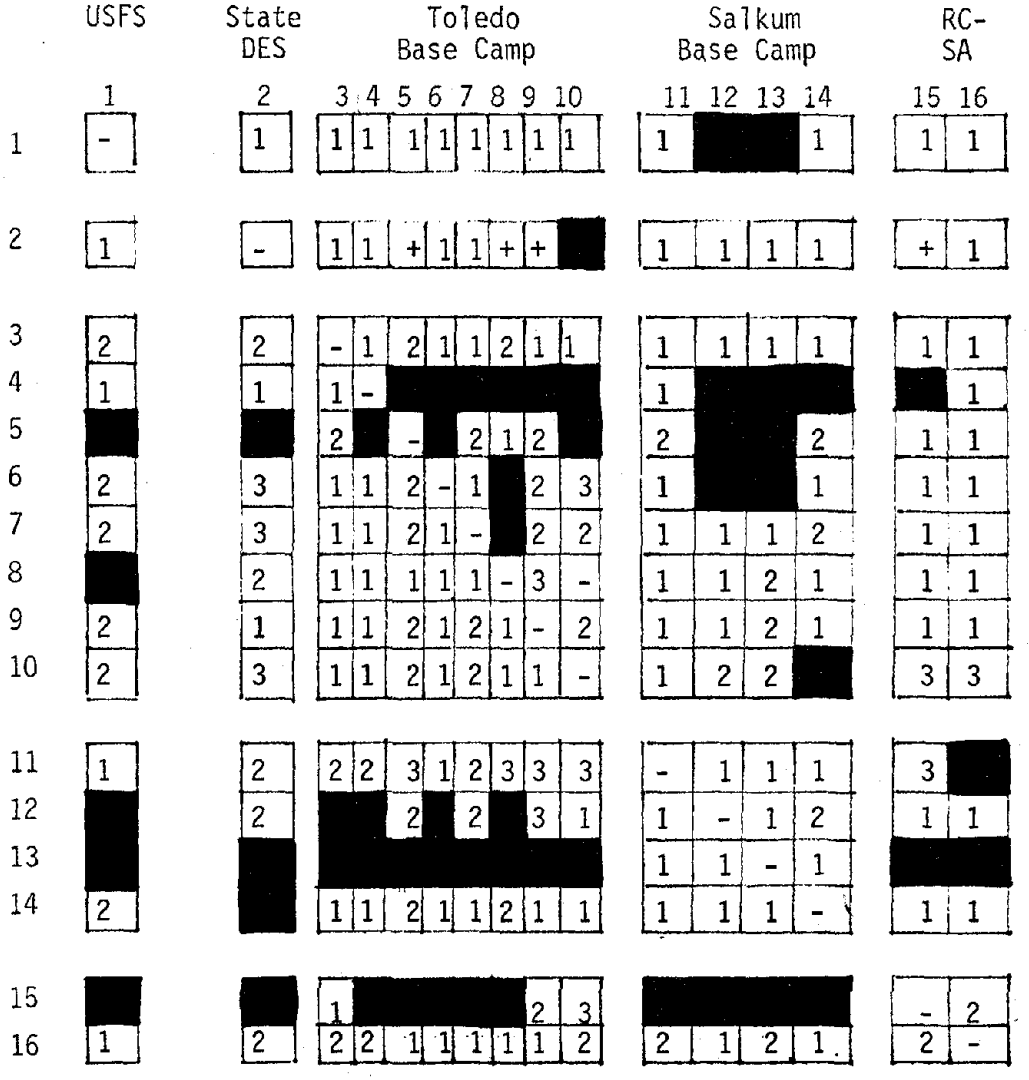
■ = no communication

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment
8. Air National Guard
9. Civil Air Patrol
10. Cowlitz County Coroner
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Red Cross
16. Salvation Army
17. 593rd Support Group

*See Figure 13.
**See Figure 13.
***Ranks were calculated by: 1)converting any score of "1" to "3" and any "3" to "1"; 2)adding the total scores of each column; 3)dividing by 15 (the total number of possible scores); and 4)ranking the resultant numbers from the highest to the lowest.

FIGURE 18
MOUNT ST. HELENS SAR RESPONSE
TUESDAY THROUGH FRIDAY, MAY 20-23, 1980
INTERORGANIZATIONAL COORDINATION*



1 = very well organized 65% (116)
2 = somewhat organized 27% (49)
3 = slightly or not organized 8% (14)
100% (179)

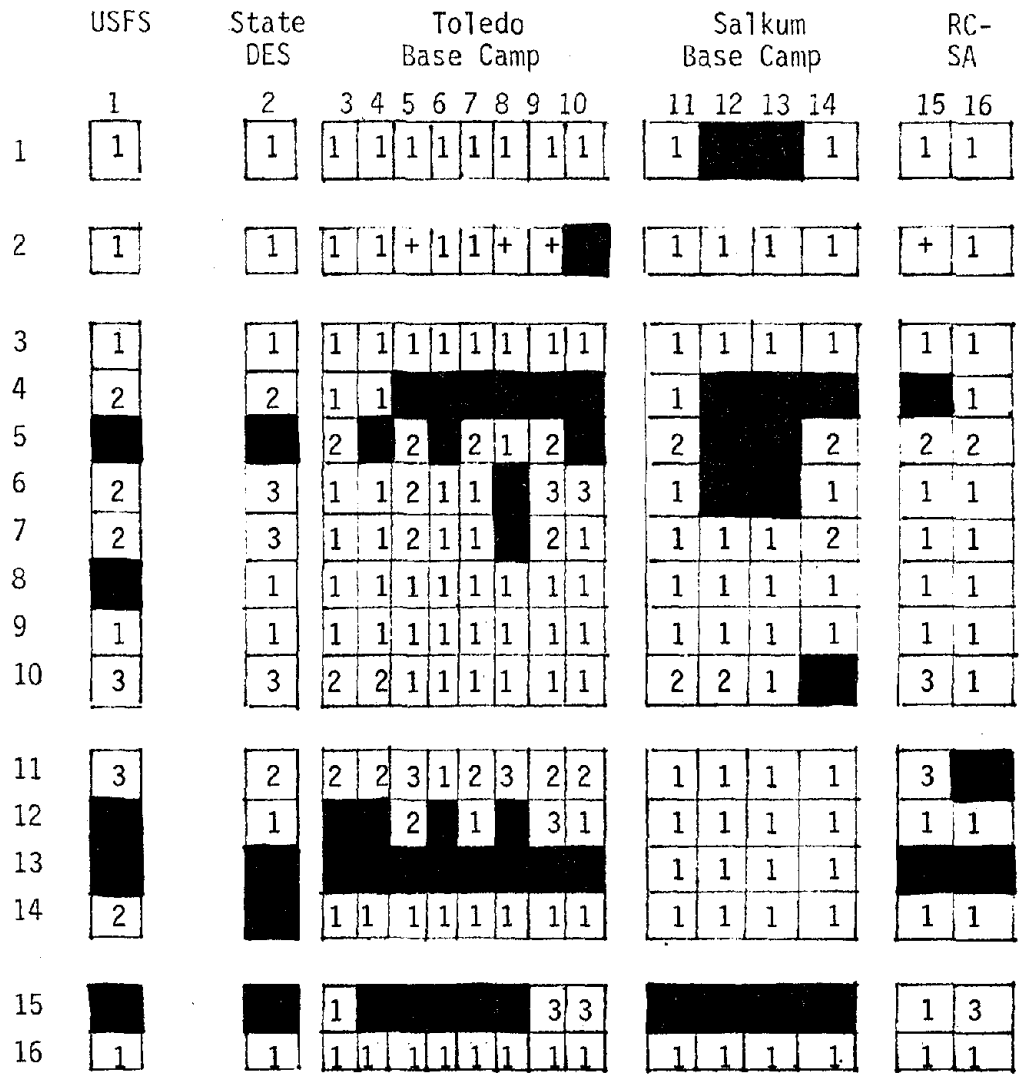
■ = no communication (56)

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment (USA)
8. Air National Guard
9. Civil Air Patrol
10. Cowlitz County Coroner
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Red Cross
16. Salvation Army

*See Figure 14.
+See Figure 14.

FIGURE 19
MOUNT ST. HELENS SAR RESPONSE
TUESDAY THROUGH FRIDAY, MAY 20-23, 1980
ORGANIZATIONAL EFFECTIVENESS*



1 = very well
2 = well
3 = fairly well to poor

78% (153)
14% (28)
8% (15)
100% (196)

■ = no communication (56)

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment (USA)
8. Air National Guard
9. Civil Air Patrol
10. Cowlitz County Coroner
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Red Cross
16. Salvation Army

*See Figure 15.
+See Figure 15.

Saturday Through Sunday, May 24-June 1

The basic structure of the multiorganizational system that had been established during the previous three days was maintained and routinized during these last nine days of the SAR operation. Body recovery was the primary objective--although some rescues were made of people who had entered the impact area illegally. The Air National Guard had ended its involvement by this time while the Toledo Fire Department, Lewis County Explorer Search and Rescue (ESAR), and the SAR Dog Association (SARDA) were brought in to help in the body recovery task.

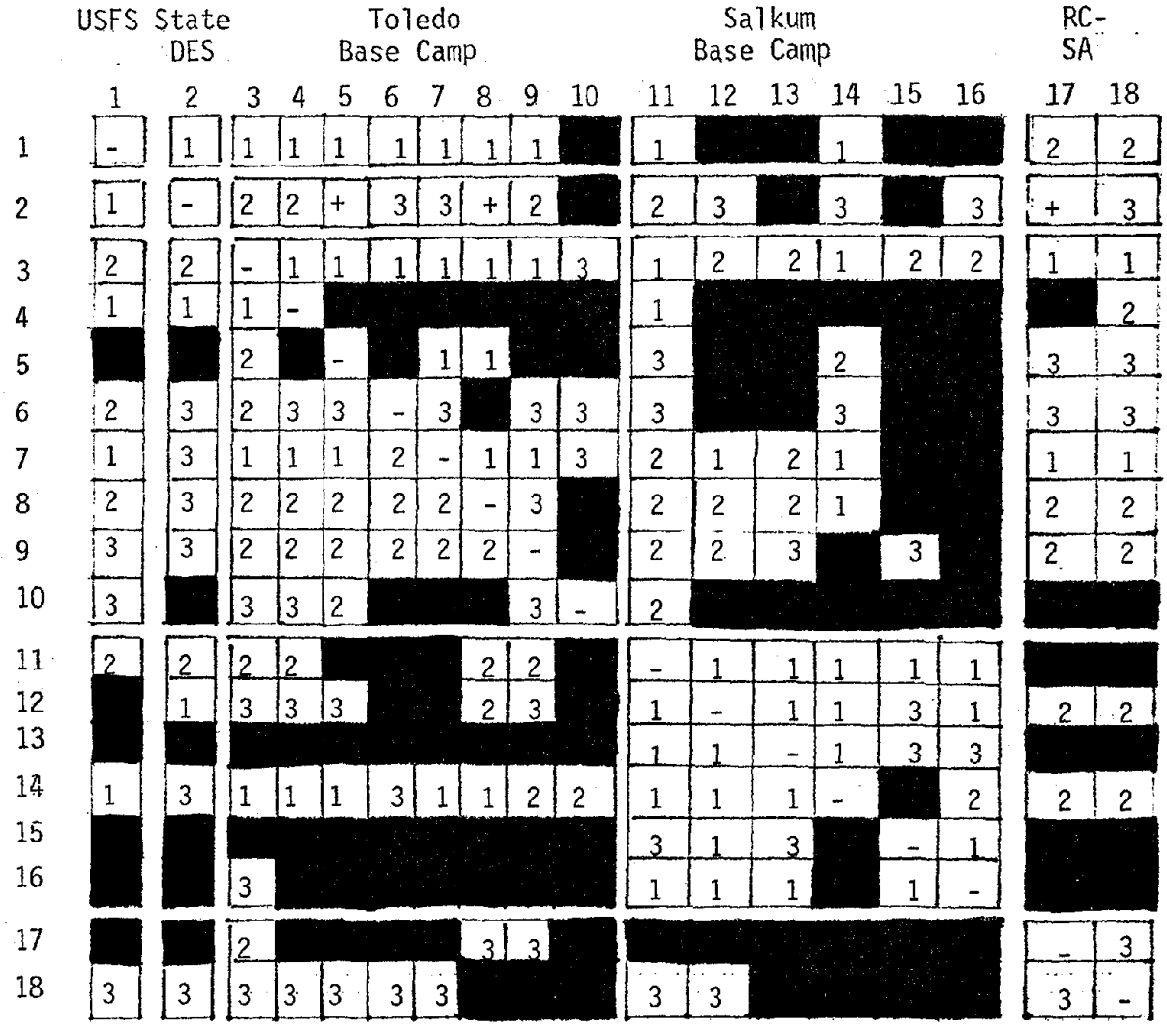
With a more established and routinized operation at both base camps, interorganizational communications lessened somewhat. Figure 20 shows that both the density (60%) and the frequency (22% "continuous"; 19% "about once an hour to every few hours"; and 19% "about once a day or less") are lower than the corresponding figures of the preceding time period. Yet, they remain higher than those of the first two days.

This same moderating trend is evident in other data contained in Figure 20. The two base camps maintained 56% of the possible communication linkages, down from a high of 69% during the last time period. The main communication link, the 6th Detachment, 602nd TACW, continued to have mostly continuous contact with organization in both base camps. Within the two groups, communication densities were 71% for Toledo and 90% for Salkum.

Finally, the only finding continuing in the same direction established during the first two time periods concerns the Red Cross and Salvation Army. Their share of the total non-linkages lessened to only 24%.

To some extent, all of these findings must be considered in light of the three new organizations that entered the system, i.e., the Toledo Fire Department, Lewis County ESAR, and SARDA. Fully 54% of the total non-linkages

FIGURE 20
MOUNT ST. HELENS SAR RESPONSE
SATURDAY THROUGH SUNDAY, MAY 24-JUNE 1, 1980
INTERORGANIZATIONAL COMMUNICATIONS*



1 = continuously
2 = about once an hour to every few hours
3 = about once a day or less
■ = no communication

22% (67)
19% (58)
19% (56)
40% (122)
100% (303)

Density = 60%

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment (USA)
8. Civil Air Patrol
9. Cowlitz County Coroner
10. Toledo Fire Dept.
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Lewis County ESAR
16. SAR Dog Association
17. Red Cross
18. Salvation Army

*See Figure 12.
+See Figure 12.

involved these three organizations. All three had minimal roles in the overall operation, and the latter two did not begin their involvement until the last few days of the response (Doran, 1980).

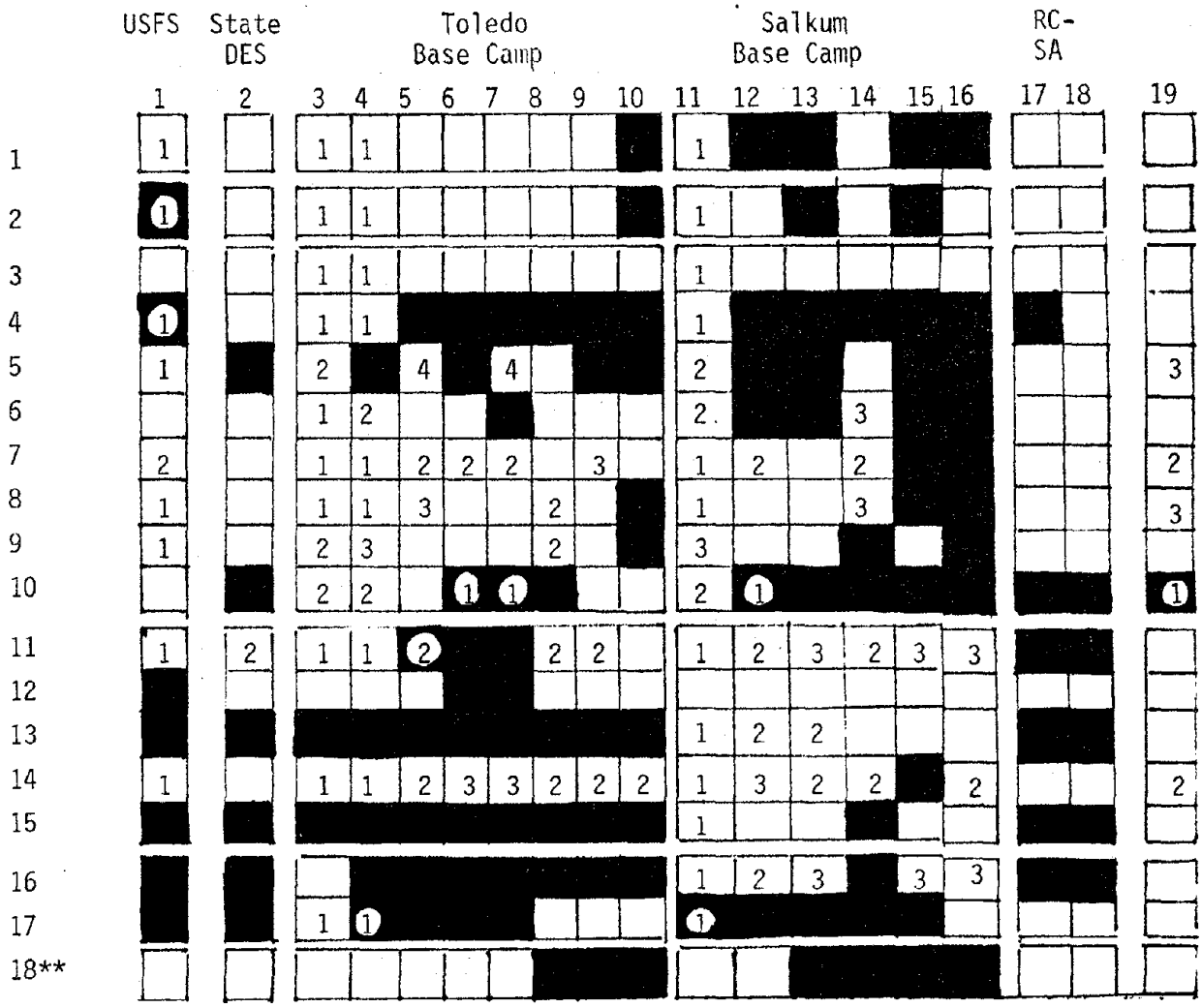
The chain of command established during the last time period continued to operate throughout the remainder of the operation (see Figure 21). All but four of the "1" rankings were given to the three county sheriff's departments and the USFS. The next highest rankings were again given to military units at both base camps, e.g., the 3rd-5th Cavalry, the 593rd Support Group, the 6th Detachment, 602 TACW, the Army National Guard, and so on. An equal percentage (27%) of rankings were given by organizations in one base camp to those in the other base camp. And the State DES was perceived to have had almost no role in the authority structure, receiving only one out of a total of 96 rankings.

The group rankings for the Salkum base camp are identical to the previous time period, with the Lewis County Sheriff's Department clearly at the top, followed by the 3rd-5th Cavalry, the 6th Detachment, 602nd TACW, and Salkum SAR. At Toledo, the Cowlitz and Skamania Sheriff's Departments and the 593rd Support Group again occupy the top three positions, but there appears to be some shifting around of organizations in the remaining ranks. Such changes in the data, however, can be considered minor. The basic authority structure remained the same.

Interorganizational coordination continued to improve within the system, according to the data in Figure 22. Fully 81% of the linkages were "very well organized" by this time. Only 4% were perceived as "slightly or not organized", and half of these involved the State DES.

This latter finding is echoed in our final set of data in Figure 23, where three of the seven "fairly well to poor" ratings on effectiveness were

FIGURE 21
MOUNT ST. HELENS SAR RESPONSE
SATURDAY THROUGH SUNDAY, MAY 24-JUNE 1, 1980
INTERORGANIZATIONAL AUTHORITY STRUCTURE*



Overall Rank***	4	13	2	3	8	10	9	8	11	15	1	5	9	7	14	12		6
Group Rank	-	-	1	2	4	6	5	4	7	8	1	2	4	3	6	5	-	3

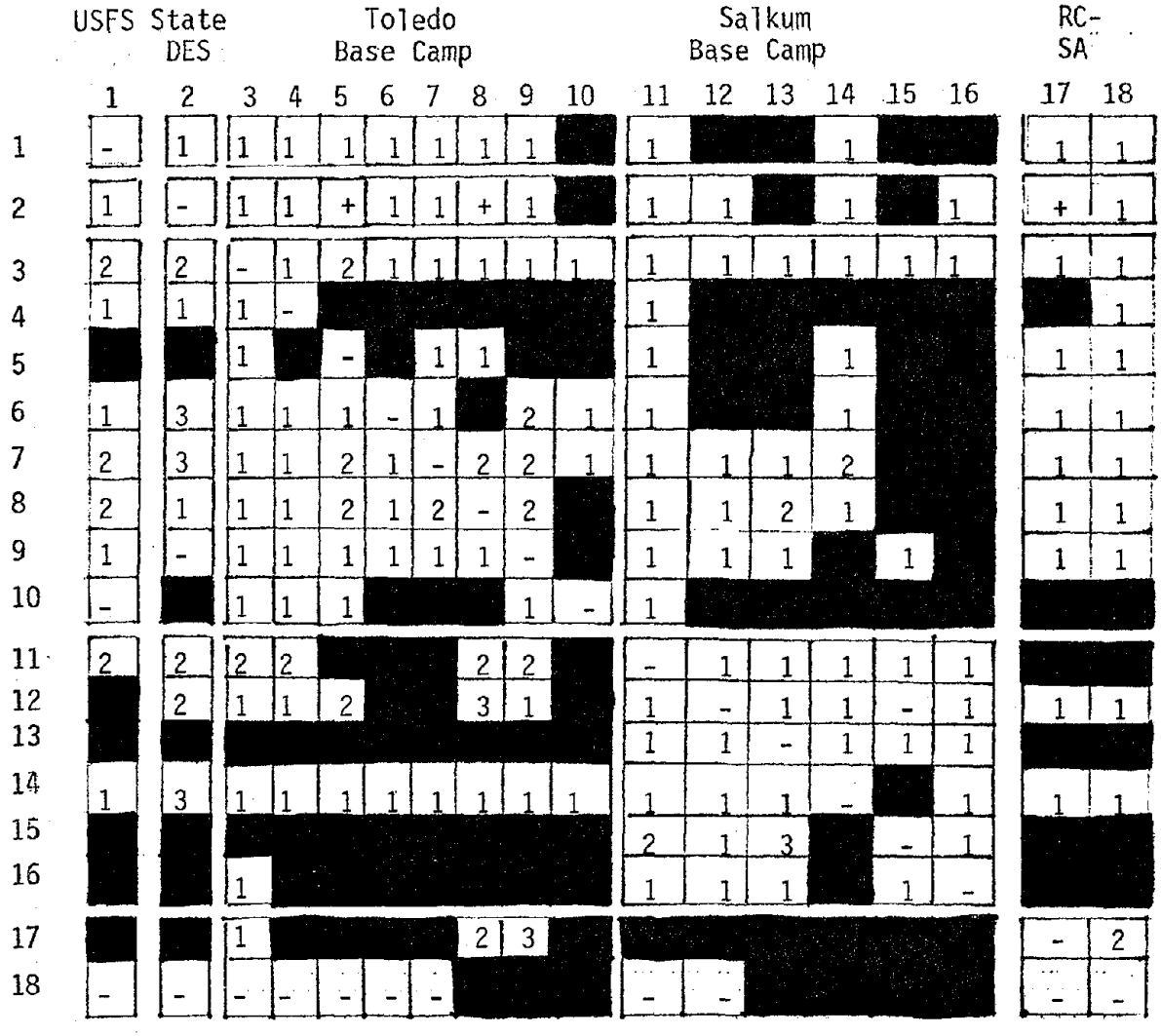
■ = no communication

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment
8. Civil Air Patrol
9. Cowlitz County Coroner
10. Toledo Fire Dept.
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Lewis County ESAR
16. SAR Dog Association
17. Red Cross
18. Salvation Army
19. 593rd Support Group

*See Figure 13.
**See Figure 13.
***Ranks were calculated by: 1)converting any score of "1" to "4", "2" to "3", "3" to "2",and "4" to "1"; 2)adding the total scores of each column; 3) dividing by 16 (the total number of possible scores; and 4)ranking the resultant numbers from the highest to the lowest.

FIGURE 22
MOUNT ST. HELENS SAR RESPONSE
SATURDAY THROUGH SUNDAY, MAY 24-JUNE 1, 1980
INTERORGANIZATIONAL COORDINATION*



1 = very well organized — 81% (137)
2 = somewhat organized — 15% (25)
3 = slightly or not organized — 4% (6)
100% (168)

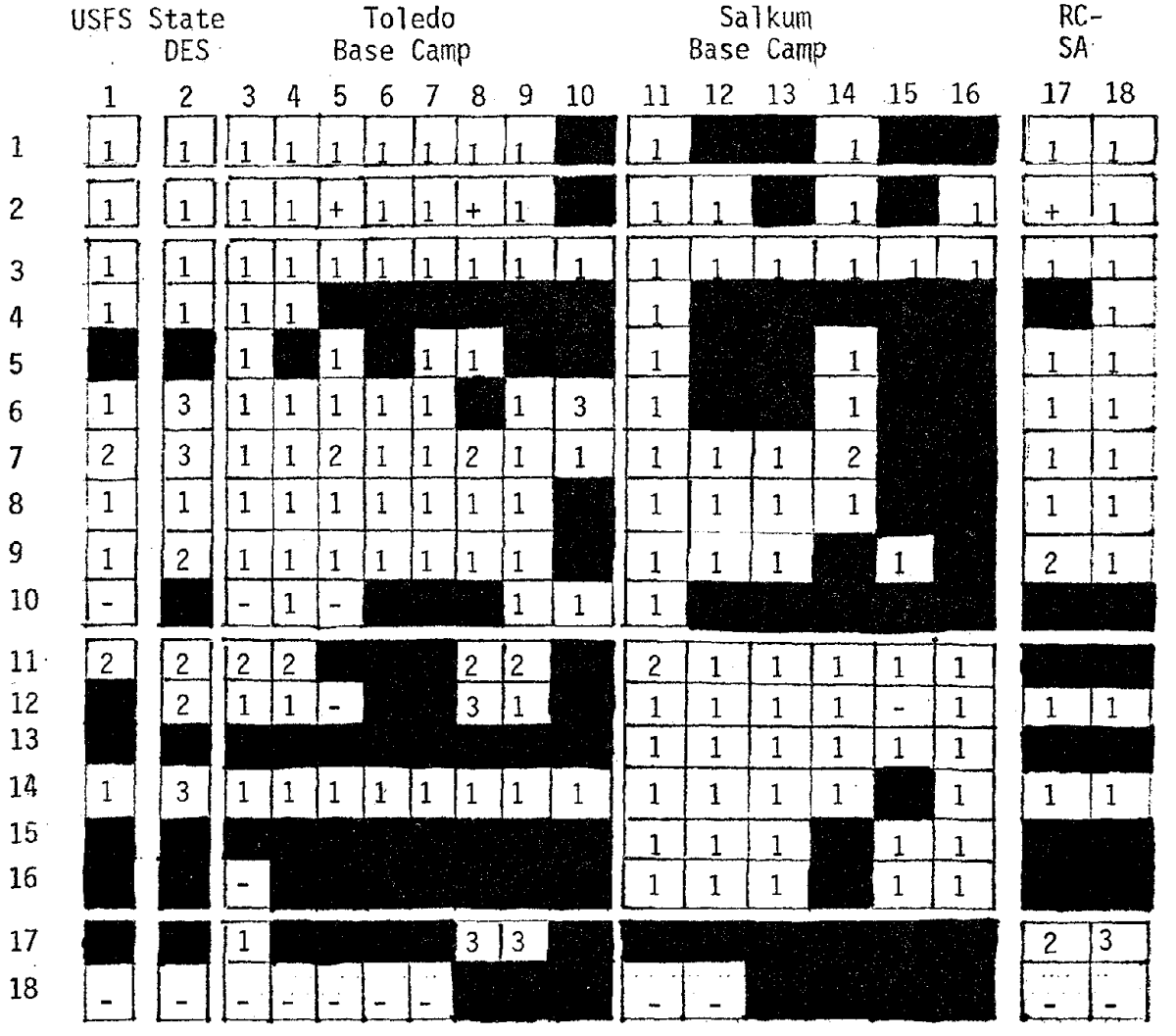
■ = no communication (122)

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment (USA)
8. Civil Air Patrol
9. Cowlitz County Coroner
10. Toledo Fire Dept.
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Lewis County ESAR
16. SAR Dog Association
17. Red Cross
18. Salvation Army

*See Figure 14.
+See Figure 14.

FIGURE 23
MOUNT ST. HELENS SAR RESPONSE
SATURDAY THROUGH SUNDAY, MAY 24-JUNE 1, 1980
ORGANIZATIONAL EFFECTIVENESS



1 = very well — 88% (160)
2 = well — 8% (15)
3 = fairly well to poor — 4% (7)
100% (182)

■ = no communication (122)

Organizations:

1. USFS
2. State DES
3. Cowlitz County Sheriff's Dept.
4. Skamania County Sheriff's Dept.
5. Army National Guard
6. 304th ARRS (USAF)
7. 54th Medical Detachment (USA)
8. Civil Air Patrol
9. Cowlitz County Coroner
10. Toledo Fire Dept.
11. Lewis County Sheriff's Dept.
12. 3rd-5th Cavalry (USA)
13. Salkum SAR
14. 6th Detachment, 602nd TACW (USAF)
15. Lewis County ESAR
16. SAR Dog Association
17. Red Cross
18. Salvation Army

*See Figure 15.
+See Figure 15.

given to the State DES--and by the same three organizations. Nevertheless, the overall effectiveness of the system improved. Our respondents gave "very well" ratings 88% of the time, compared to 78% for the last time period.

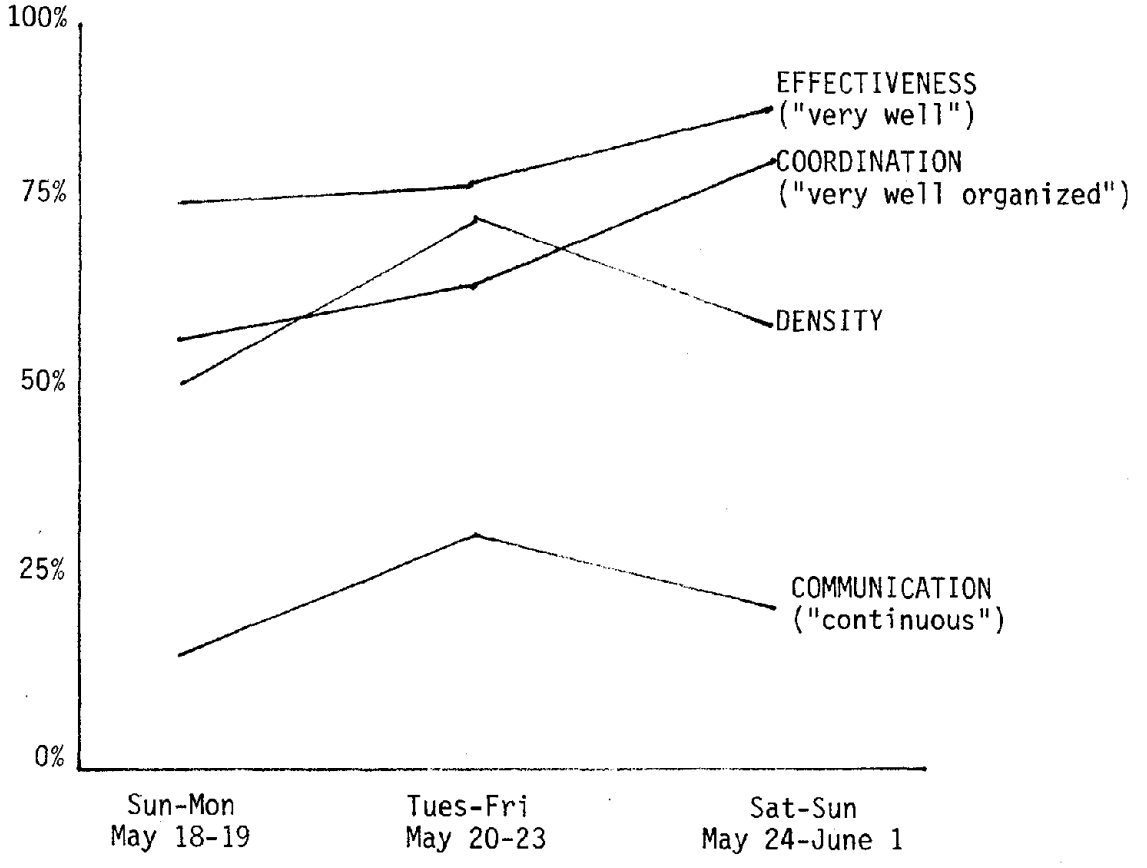
Discussion

What kind of multiorganizational SAR system emerged in response to the Mount St. Helens eruption of May 18, 1980? With the descriptive data presented in the last chapter, we learned that it was a fairly complex system involving a wide variety of local, state, and federal actors, at least four EOC's, and four different base camps. During the first few days, a number of difficulties had to be overcome before the system began to operate as a total unit. By Friday, May 23, that task had been accomplished. SAR roles were established and procedures were routinized so that the remaining days of the SAR response went fairly smoothly.

Such a perspective is also evident in the quantified data presented in this chapter. Here we took a more abstract and aggregated approach to the individual actions of our sample of organizations. And we found that the detailed descriptions given to us by our respondents were reflected in their answers to very specific questions on interorganizational communication and coordination, the authority structure, and effectiveness. Thus, the fact that both data sets reinforce each other add to the validity of each--although, admittedly, both are derived from the perceptions of the same group of individuals.

Based upon those perceptions, Figure 24 summarizes the key interorganizational processes of the system as they emerged and changed during the three time periods of the SAR operation. We see that the density of linkages begins at a moderate point, rises, and then decreases. Such a trend is also

FIGURE 24
MOUNT ST. HELENS SAR RESPONSE
A SUMMARY OF INTERORGANIZATIONAL PROCESSES*



*These data summarize some of the findings presented in Figures 12-23. Please refer to those figures for the data used in the construction of this graph.

evident in the data on continuous communication.

Interorganizational communication and organizational effectiveness, based upon the most positive ratings ("very well organized" and "very well"), however, exhibit a different trend. Both increased slightly from the first to the second time period, but then increase again for the last time period--even though both the density of linkages and continuous communication decrease.

An explanation for seemingly contradictory trends is implied in the descriptive data of the previous chapter. At first, SAR organizations within the system were occupied with forming linkages among each other and establishing communication channels to promote system-wide coordination. This process continued as the system grew in size until an overall authority structure emerged during time period two to work out the problems of overall command and control. Both coordination and effectiveness increased slightly. Once procedures became routinized, however, the need for many linkages and constant communications was reduced. Yet, coordination and effectiveness continued to increase even more because of the very same routinization process. In a sense, the extra density and communication linkages that was needed to establish that coordination and increase the effectiveness of the system became "extra baggage" once those objectives were met. The system was now "systematic".

CHAPTER VI

CONCLUSIONS: AN OPPORTUNITY TO LEARN

We now come to the last yet most important part of our case study on Mount St. Helens. Although we have presented a wealth of data in the preceding pages, our analysis would remain incomplete if we failed to address a fundamental question--What can we learn from the Mount St. Helens experience? Or to put it more succinctly, as many emergency response managers have asked us, "So what? How does this information help us do our job better?"

It is the purpose of this last chapter, in the last of 11 technical reports on our research, to address this question. For we contend that our three and one-half years research experience, culminating in our case study of Mount St. Helens, has taught us some very useful lessons. We propose that these lessons will indeed help the emergency response manager do his job better--if he is willing to look beyond the traditional civil defense approaches. Even further, as we have suggested elsewhere (Drabek, et al., 1981), contained within the results of our research are the seeds for a more effective approach to emergency response management. Finally, we submit that students of interorganizational behavior can reap some important insights from our data analyses.

The basis for arguing these assertions is the data presented in the preceding pages, although we will draw upon findings of our other five case studies when appropriate. Disasters are unique events, but we have discovered that responses to those events have some common elements. We refer to those commonalities as patterns--patterns of behavior that can be

found in southwest Washington state or southwest Texas, and in response to a "mini" tornado or a cataclysmic volcano. Just as meteorologists and seismologists are making studies to explain and control nature's forces, so too are we as social scientists attempting to better understand and improve the human response to those forces. With our research, we think we have come a little closer to doing just that.

We begin by briefly reviewing the research strategy used for the Mount St. Helens case study--one that reflects those used for each of our case studies. We then draw out many of the parallels between this disaster and other types of disasters--specifically, earthquakes. Policy recommendations for emergency management are discussed, followed by a broader analysis of interorganizational behavior based upon these data.

Recapping the Research Strategy

Beginning in January, 1978, we had been collecting data for a fairly comprehensive assessment of search and rescue in the state of Washington. The state had gained a good deal of recognition during the late 70's for its organization of SAR. It had created an interorganizational system, with the State DES as the central agency, of linking local SAR needs to state and federal resources. Over 300 local, state, federal, and volunteer organizations participated in this system. And it appeared to work fairly well for the 4-500 routine, remote setting SAR missions it responded to each year.

Although we did not know it at the time, what we had here was a pre-disaster data base for Mount St. Helens. And it was really pre-disaster data, not the retrospective data that is typically found in the disaster literature.

With the May 18, 1980, eruption of Mount St. Helens, we saw a unique opportunity to examine this SAR system's response to a far less routine mission. Given what we already knew, how would it respond to a set of SAR demands that far exceeded anything it had experienced previously? This was a question we had in mind as we went into the field and, within six weeks after the eruption, interviewed 46 representatives from the 36 organizations most involved in the SAR activities. Many of these same organizations and even the same individuals had participated in our earlier data collection effort. Thus, a sense of rapport had already been established that aided us in obtaining a fairly comprehensive set of data.

Using two different instruments, we were able to obtain five types of data on: 1) prior community SAR capabilities; 2) SAR demands generated by the disaster; 3) the SAR response of individual organizations; 4) the SAR response of the emergent multiorganizational system; and 5) operational problems and observations. Additional data relevant to SAR activities, such as organizational documents and media publications, were collected whenever possible to augment our primary data base.

Thus, we view this research strategy as providing the most comprehensive and systematic information available on a SAR response to a natural disaster. Its strengths and limitations however, as enumerated in Chapter I, should be considered in weighing the validity of the data. Given the phenomena under study and our research objectives, we would argue that our data is substantial.*

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*As an added check on the factual accuracy of our data, we sent portions of this report to a number of individuals for their review. We would like to thank Rick LaValla (State DES), Sheriff Bill Clousner (Skamania Sheriff's Department, Ed Osmond (USFS), Skip Stoffel (Co-Director, Emergency Response Institute), Colonel James L. McElhaney (AFRRC), Ben Bena (Cowlitz County DES), and Bruce Foxworthy (USGS) for their helpful comments.

Beyond Mount St. Helens

So, let us return to the question before us--What can we learn from the Mount St. Helens experience? Perhaps a question that needs to be addressed first, however, is why should we have any special interest in this disaster at all? Is it just a matter of its uniqueness in the history of American disasters? Is it because of the media barrage that aroused the attention of the world? And consequently, have we merely added another volume to the plethora of case studies on natural disasters? We think not.

There are, of course, the obvious parallels that can be made between Mount St. Helens and other potentially dangerous volcanoes in the Cascade Range, e.g., Mount Rainier, Mount Baker, and Mount Shasta (Warrick, 1975), and the USGS is currently engaged in using the Mount St. Helens experience to help prepare state and local agencies for their possible re-awakening.* We would suggest, however, a more relevant comparison to earthquakes--a hazard of particular concern to the research as well as policy-making communities (National Academy of Sciences, 1975, 1978; Mileti, et al., 1981). This concern revolves around not only the catastrophic impact of a major earthquake, but also the developing earthquake prediction technology. If an earthquake prediction is made possible before the end of the century, how should government entities react? What kinds of decisions will they be forced to make? And what will be the consequences?

We propose that many of those same decisions confronted decision-makers involved with Mount St. Helens. An eruption was predicted--as early as 1978 with the Crandell and Mullineaux report. At that time,

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*Personal conversation with Clement F. Shearer, Deputy Hazards Information Coordinator, USGS.

very little if any reaction took place outside of the scientific community.

Then we have some measurable activity starting March 20--fully eight weeks before the May 18 eruption. Taking a close look at what occurred during those eight weeks gives us a real-life picture of how local, state, and federal agencies, as well as the media and the general public, react to a disaster prediction. As Saarinen (1980) points out, "The amount of foreknowledge and warning for Mount St. Helens was probably greater than for any previous geological hazard in history." What do you do when you have a volcano in your backyard and it is brewing a disaster within its depths?

Other similarities between Mount St. Helens and earthquakes can be identified which are not as applicable to other types of natural hazards. For the present time, a prediction for either one still relies upon past history of the hazard. Thus, what are the potential future impacts is assumed to be predicted upon past facts. Yet, as we saw with the May 18 eruption, the volcano's lateral blast was not predicted to occur. The prediction was not totally accurate. We would surmise that this would also be the case for a major seismic event, unless earthquake prediction technology takes a giant leap forward in the next few years. Thus, it is instructive to examine how the various agencies reacted to a situation wherein the pre-disaster planning for a specific event was not totally in line with what actually took place. This kind of situation is different from the typical disaster response planning for flash floods, tornadoes, and so on, wherein a much larger set of contingencies is assumed.

Both Mount St. Helens and earthquakes are to a certain extent geographically located hazards--we knew where the volcano was going to erupt and we know where the California or New Madrid earthquake will occur. Thus, an impact area can be ascertained well in advance of the event. Yet, both can significantly affect communities at a distance from the main impact area. With Mount St. Helens, the ashfall in Eastern Washington played havoc on communities over 100 miles away. In a major New Madrid earthquake, for example, major gas pipelines from Louisiana and Texas to the central and northern United States pass through an area that can be expected to experience strong ground shaking (Nuttli, 1981).

Both types of disasters can cause significant topographical changes that can disorient, to some degree, emergency response personnel. Secondary effects, such as fires and flash flooding, are very likely after a major earthquake as they were following the May 18 eruption. And too, just as Mount St. Helens continues to impact the area today with intermittent eruptions and ashfalls, a major seismic event is likely to be followed by aftershocks. Again, the post-disaster response--especially the SAR operation--can be hampered by the uncertainty of such aftereffects.

Finally, the general public as well as emergency response agencies, were totally unfamiliar with a Mount St. Helens eruption since the last one occurred over 100 years ago. Likewise, outside of California, people living in high seismic risk areas tend to have little if any idea of the consequences of a major earthquake and are ill-prepared for such an eventuality (Nuttli, 1981; Kilijanek and Mushkatel, 1981).

On the other hand, there are some important differences in magnitude between the Mount St. Helens eruption and a major earthquake. For the

latter event, the impact area would probably be larger and more highly populated. Consequently, the potential loss in lives and property and disruption to society would be much more severe (National Academy of Sciences, 1975, 1978; Mileti, et al., 1981; U. S. Geological Survey, 1975, 1976; Nuttli, 1981; White and Haas, 1975). Such a real possibility, however, gives us all the more reason to learn as much as we can from Mount St. Helens.

In sum, as opposed to studies on the human response to earthquake predictions that ask respondents to imagine how they would react to a hypothetical set of circumstances (Haas and Mileti, 1977; Turner, et al., 1979)--studies that are riddled with problems (Mileti, et al., 1981)--Mount St. Helens presents the opportunity to examine an actual response to a disaster prediction. What we can learn from Mount St. Helens is a better understanding of the relationships among that disaster prediction, planning based upon that prediction, and the response to the disaster itself. Rather than being reasonably straightforward, as one would assume given the analyses of hypothetical scenarios of earthquake predictions, each of these relationships were couched in a political atmosphere wherein no easy decisions were forthcoming. And no one knows this reality better than those who were confronted with such decisions for a mountain called St. Helens. Let us see what they learned as a result.

Policy Recommendations

From the very beginning of this project, we have been committed to making our research relevant to the concerns of the SAR practitioner, the emergency response manager, and the disaster researcher as well (Drabek et al.,

1981).* We wanted to provide some pragmatic guidelines to those confronted with the reality of responding to emergency situations, to answer the, "So what?" question so often asked, but not always answered.

With this goal in mind, we have identified a set of eleven policy recommendations based upon the data presented in the preceding chapters. Many of these recommendations echo those of our previous case studies and, therefore, are not unique to the Mount St. Helens SAR response. Taken together, we believe that these recommendations can contribute to a more effective approach to emergency management.

We begin with our most important recommendation, yet one that is often overlooked by disaster planners.

- Emergency response managers must adopt an open systems perspective in both disaster planning and response.

We propose that a more effective approach to emergency management is suggested by our conceptual framework (see Chapter I). All too often, as we saw with the National Guard at Mount St. Helens, a manager will view his organization as a "closed" system that acts independent of other organizations in its environment. Such a view may be more appropriate for the daily, routine operations that an organization is involved with, but is less so for the disruptive, crisis situations associated with disasters. In these situations, a manager should consider his organization as an "open" system that is dependent upon other organizations to achieve the goals of both disaster planning and response. The manager is then forced to view the development and maintenance

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*In order to assure that this objective would be met, we assembled an advisory committee composed of representatives of SAR agencies and leading disaster researchers throughout the country (see back cover for a listing of committee members). Without question, their guidance proved to be invaluable during all phases of the research project.

of interorganizational linkages as the central task. Decisions will be made with an interorganizational frame of reference, and will necessarily involve the participation of other emergency response organizations.

It is to the credit of officials at the U.S. Forest Service (USFS) that an open system perspective was adopted from the very beginning of the planning process for Mount St. Helens. Although they could have devoted their resources solely to the disaster preparedness goals of their own organization, they realized that those goals could not be effectively met without the involvement of other agencies on the local, state and federal level. The USFS-sponsored contingency planning, by establishing lines of communication and coordination among organizations, was a critical factor in the overall success of the SAR response to Mount St. Helens.

With this interorganizational approach as the basis for disaster planning, SAR officials had to face a key issue. What will be the impact of a major eruption? To answer this questions, they sought the advice of scientific experts.

- The USGS should expect to assume an important public relations role in the planning process based upon a disaster prediction of a geological hazard.

What do you do when you have a volcano in your backyard, and it is brewing a disaster within its depths? For those involved with Mount St. Helens, as it would be for any other volcano or earthquake prediction in the United States, you turn to the expertise of the U.S. Geological Survey (USGS) with specific questions--when, where, what, how, and how much. It was the USGS that SAR authorities, emergency response managers, the media, and the general public expected to readily provide the answers to what was occurring and what would occur at Mount St. Helens.

Such a public relations role was not entirely familiar to this essentially scientific organization. Virtually ignored in regards to Mount St. Helens prior to March 20, USGS personnel suddenly were in the limelight of the world media. They now had to face the questions of a mixture of public and private agencies, each of which had varying interests in relation to the volcano. The answers they gave would have social, political and economic consequences for these organizations.

Given the many unknowns of volcanic behavior, and the typically cautious approach of scientists, the information provided by the USGS did not necessarily form the basis of policy decisions in a straightforward manner. One reason was the uncertainty of the disaster predictions.

- Emergency response managers must recognize the uncertainty associated with a disaster prediction.

For Mount St. Helens, it was not possible to predict precisely what was going to happen during a major eruption and when it was going to occur. Except for the fact that a major eruption would occur sometime in the future, all other predictive statements were in probabilistic terms. Thus, other less probable, but still possible, contingencies should be addressed.

Decisions had to be made in an atmosphere of uncertainty, allowing various parties to question anything contrary to their own interests.

- Emergency response managers must recognize the poltical nature of planning based upon a disaster prediction.

Because of the uncertainty of the Mount St. Helens prediction, there was room for negotiation in the decision-making process. For example, a key goal for SAR authorities was to keep people out of the probable impact area and thereby minimize the need for a SAR response. The decision on where to draw the boundaries of the impact area, however, would affect private property owners, logging interests, recreational interests, and a host of private and

public organizations. It was by no means an easy decision to make. Once it was made, the uncertainty of when a major eruption would occur led to another politically difficult decision: How long should the impact area be restricted? Should it be restricted one year, ten years or twenty years? No one really knew. Everyone did know, however, that the longer the restriction was in force, the greater the economic and social costs.

One of the more immediate costs of the impact zone restriction confronted SAR authorities. Without a state emergency fund or federal funding, all agencies had to rely upon their existing revenue base in reacting to the disaster prediction. Especially for the smaller county sheriff's departments, just manning the roadblocks proved to be a major drain on their budgets. And while Mount St. Helens was presenting a large and unforeseen demand on these agencies, their day-to-day operations had to continue.

The crux of this problem revolves around the incongruity between the federal, local and state approaches to Mount St. Helens. Federal disaster aid was based upon a reactive mode. The disaster had to occur first before any relief funds were given to the impact communities. Meanwhile, local and state resources became strained in order to prevent or lessen the need for such assistance in the first place--a more effective, proactive approach to minimizing loss of life and property. The primary advantage of a disaster prediction is that it allows such a proactive approach.

- Federal disaster policy should adopt a proactive approach to disaster predictions.

The Federal Emergency Management Agency (FEMA), as the lead federal disaster agency, has already recognized the advantages of taking a proactive approach in Southern California (i.e., Southern California Earthquake Preparedness Project) as a result of the catastrophic earthquake that is predicted

to occur there at some point in the not-too-distant future.* Although the prediction is fairly non-specific at this time, there is a recognition that federal involvement prior to the disaster event is warranted.

We propose that this recognition should be incorporated into federal disaster policy for all predicted events, both volcanoes and other earthquake-prone areas. When a Mount Rainier or New Madrid fault zone begins to show signs of an impending calamity, a mechanism will then be in place to assist likely impacted communities in their efforts to lessen the loss of life and property prior to the impending disaster. In this way, the full advantages of a disaster prediction can be realized.

Turning to the actual SAR response to Mount St. Helens, we can only begin by pointing out an inescapable conclusion--it was a large and complex operation. Figure 25 gives us a glimpse of one aspect of this complexity. It illustrates the communication linkages among just the 27 organizations in our sample that existed during the first two days of the SAR response (i.e., Sunday and Monday). And we know that the response grew even more complex following this initial time period.

Given this magnitude of complexity, and the many unknown SAR organizations faced, numerous tasks were successfully accomplished. Many of our respondents indicated that the majority of those who lost their lives did not have a chance of surviving the eruption. Others who did survive were rescued in a reasonable amount of time, taking into account the unexpectedness of the eruption. On an individual basis, everyone we encountered was committed to aiding the victims. Many worked countless hours, putting themselves in dangerous situations to rescue all who were found alive as well as recover

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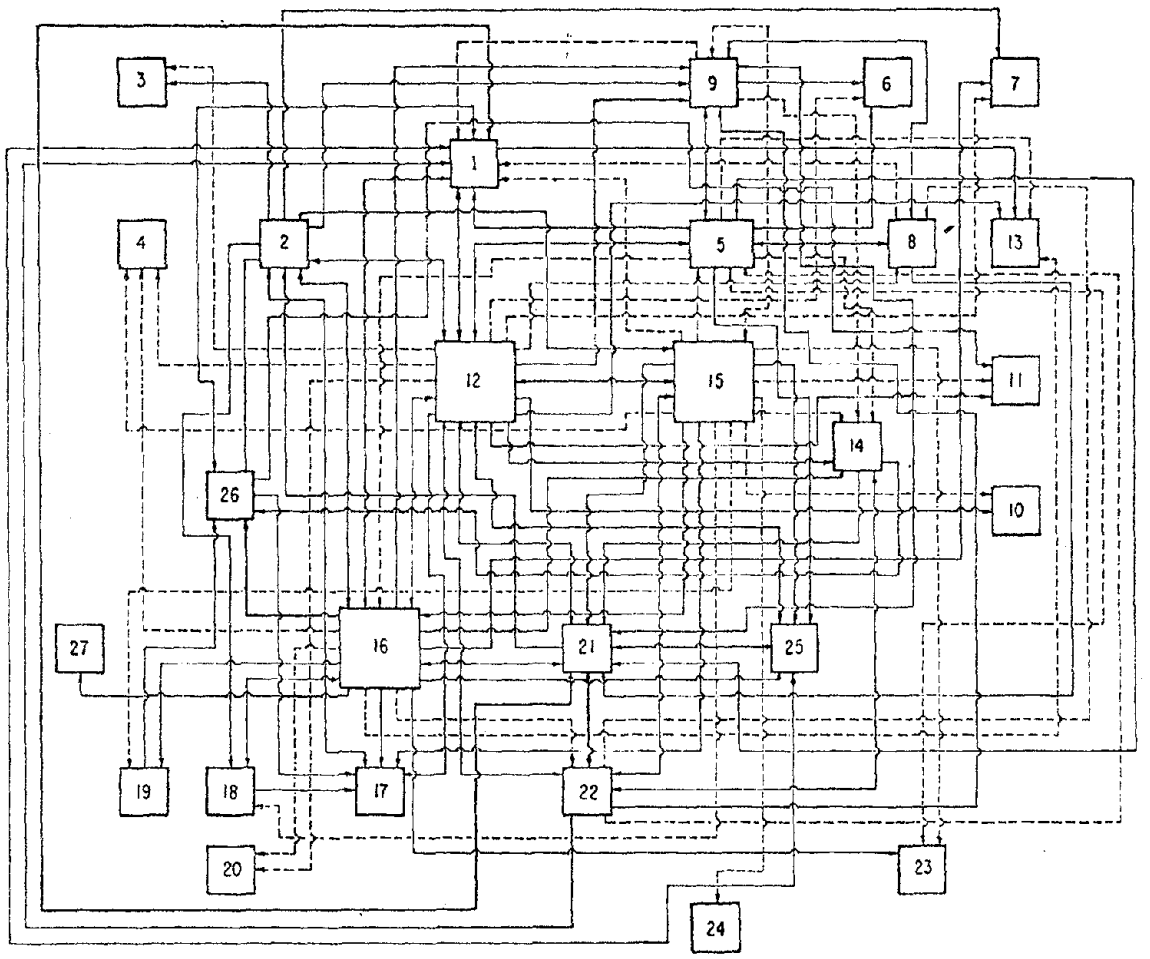
*The funding for this project, interestingly enough, was initiated as a result of the May 18 eruption of Mount St. Helens.

FIGURE 25

MOUNT ST. HELENS SAR RESPONSE
SUNDAY AND MONDAY, MAY 18-19, 1980
INTERORGANIZATIONAL COMMUNICATIONS LINKAGES*



= continuous (reciprocally designated only)

= about once per hour to every few hours

= about once a day or less

*See Figure 12 for interview item and responses. See Figure 2 for the list of organizations not present during this time period: 3, 4, 7, 10, 11, 19, 20, 23, 24.

the bodies of those less fortunate. We have found such dedication the norm among SAR personnel in each of our case studies.

These individual efforts, however, are not enough to insure a successful SAR response. As we have elaborated throughout this report, it is on the organizational and interorganizational levels that SAR is carried out in a coordinated and effective manner. Search and rescue is a multiorganizational enterprise, the essence of which is interorganizational linkages.

- Emergency response managers must understand the nature of emergent, multiorganizational SAR systems.

The lack of proper equipment or trained personnel was not a problem in the Mount St. Helens SAR operation. Rather, the major task was meshing together the various organizational responses into an integrated response system. Traditional approaches to organizational management, however, are of limited utility for accomplishing such a task. The very nature of an emergent, multiorganizational SAR system requires a process of negotiation among its participants. Internal structure is not a given, as it usually is in ongoing organizations. Rather, it evolves through a process of give-and-take in which organizational managers try to establish a consensus about authority, communication, coordination, and so on. In building that consensus, organizational managers must be innovative and flexible.

- Emergency response managers must recognize the need for innovativeness and flexibility in emergent, multiorganizational SAR systems.

Mount St. Helens provides us with an excellent example of the need for innovativeness and flexibility in SAR management. We described earlier how SAR authorities, based upon the best scientific information on what would occur following a major eruption, planned the specific multiorganizational system that would respond. In this sense, the disaster prediction allowed

the process of negotiating a consensus to begin prior to the actual eruption. It also permitted that planning process to focus in on certain probable contingencies and ignore less probable ones. Yet, what was not thought likely to occur, a lateral blast, in fact did occur.

The result--on the one hand, the multiorganizational SAR system that emerged did reflect to a certain extent the planning process. The USFS EOC became fully operational with communication linkages to other key organizations. Evacuation procedures began as a first priority. SAR began under the separate authorities of the county sheriff's departments. The State DES established their EOC and provided the linkages necessary to obtain needed military resources quickly. The media was briefed at the USPS in Vancouver.

On the other hand, circumstances dictated a number of unplanned actions, thus altering the structure of the multiorganizational SAR system that had been negotiated under USFS-sponsorship. For example, the National Guard, under their separate plan, responded more or less independently. Lewis County SAR authorities, partially included in the pre-disaster planning process, set up a base camp at Salkum that was not fully coordinating its activities with other parts of the response system, e.g., other base camps and the USFS EOC.

Due to the disparity between what was planned and what actually occurred on May 18, SAR authorities had to thus confront the problems in the structure of the multiorganizational system that did emerge. They had to reorient their thinking and seek out a more effective approach to meeting the SAR demands. They had to be flexible and innovative enough to realize their planned multiorganizational structure would not work.

Meeting at Kelso on Tuesday, SAR authorities formulated a multijurisdictional plan that would bring overall control and coordination to the SAR

operation. Implementing this more centralized system, however, required a renegotiation of its internal structure with a larger set of organizations. As we had documented in Chapter IV, this was by no means an easy task.

A main issue revolved around the authority structure. Which organization(s) were going to be in charge? Such an issue does not usually confront an organizational manager in his daily activities, for a hierarchical authority structure is a given and not open to question. At Toledo, however, SAR officials did have to confront the ambiguous nature of interorganizational authority. They had arrived under various mandates and with different expectations. In forging a consensus, the distinction between coordination and control became an underlying factor.

- Emergency response managers must recognize the critical distinction between coordination and control in emergent, multiorganizational SAR systems.

Within an organization, authority usually means both control and coordination resources, whether those resources are personnel or equipment. Within a multiorganizational SAR system, however, authority is equated with coordination of resources. Representatives of the three sheriff's departments and the USFS, perceived by our respondents as the key members of the authority structure at the Toledo base camp, made key decisions on how the SAR demands would be met. Their role then became one of coordinating the resources of a multitude of organizations to implement those decisions. Yet, resources remained under the control of their respective organizational managers.

This distinction is oftentimes a result of an implicit understanding among SAR officials who have developed a set of expectations concerning interorganizational authority. This is one reason why prior planning is so important--it establishes those expectations beforehand. It is also the reason why organizations which interacted prior to a disaster on any sort of routine

basis had less problematic interorganizational relations during the post-disaster response.

In the Mount St. Helens SAR response, it took time for SAR officials to reach a consensus on interorganizational authority, despite the prior planning efforts. As we had elaborated on earlier, this situation was due in part to the disparity between the planned and the actual SAR demands. Even with the aid of a disaster prediction, it was not possible to know exactly which organizations will be needed for a Mount St. Helens SAR response. Thus, officials from organizations uninvolved in the USFS-sponsored planning process did not share the same expectations concerning interorganizational authority that those which were involved had reached a consensus on prior to May 18. This situation is typically the case for post-disaster SAR responses. What emergency response managers need to do is to plan a mechanism for integrating these organizations into the multiorganizational SAR system.

- Emergency response managers must develop a set of procedures for integrating new organizational actors into the multiorganizational SAR system.

Just as an organization has an orientation for new members, so too must a multiorganizational system have a mechanism to orient new organizations on its internal structures, especially its authority structure. Only then will all organizational officials develop a shared set of expectations.

Managing the internal structuring of a multiorganizational SAR system, however, is only half the battle for emergency response managers. The other half revolves around the inevitable interaction of that system with its external environment. Two important audiences in that environment are the media and the family, friends, and neighbors of dead and missing victims. As we saw at Mount St. Helens, and in other post-disaster SAR operations

we have studied, inadequate planning for dealing with these two external groups can lead to difficulties.

- Emergency response managers must develop a set of procedures concerning the interaction between the multiorganizational SAR system and the media.

Dealing with the media should be considered a part of SAR management. It is the media which will describe the SAR operation to the general public. Planning a set of procedures for the orderly and timely flow of information to media representatives will help to insure a more accurate description of what is occurring within the SAR system. Such planning did occur prior to the May 18 eruption, and information was given to the media at press briefings in Vancouver. Yet, once the eruption did occur, reporters quickly followed "the action" to the various SAR base camps where SAR officials were not totally prepared to handle their numerous inquiries. It was not until Friday, six days into the SAR response, that an effective set of procedures for responding to the media was established at the Toledo base camp.

Effective SAR management requires the orderly transmission of information not only to the general public via the media, but also from the general public to the SAR system. We are in particular referring to valuable information that family, friends, and neighbors of dead and missing victims might have that will assist SAR personnel in their search and recovery efforts.

- Emergency response managers must develop a set of procedures for the systematic collection of information concerning dead and missing victims.

A lot of time and effort of SAR personnel was devoted to straightening out the various missing persons lists that had been compiled by a number of agencies during the first few days following the eruption. If there had been

a set of procedures developed beforehand to centralize all incoming information in one agency, then this difficulty could have been avoided. Such procedures have been included in the present SAR plan for Mount St. Helens (Miller et al., 1980), to the credit of SAR officials.

In conclusion, these eleven recommendations provide what we consider the core "lessons learned" from the Mount St. Helens SAR response. We suggest, however, that other valuable lessons concerning emergency response management can be gleaned from the preceding chapters. So, imagine yourself in the place of one of our respondents, and ask yourself how you would have managed the large and complex multiorganizational SAR system that emerged at Mount St. Helens. Or even better, how would you better manage the disaster response in your own backyard? If you arrived at any answers based upon this case study, and we sincerely hope you have, then we all have succeeeded in learning from the tragic event at a mountain called St. Helens.

Insights Into Interorganizational Interaction

Beyond the more pragmatic concerns of disaster planners and emergency response managers, this study provides a number of insights into the dynamics of interorganizational interaction. We, as social scientists, are interested in developing a theory of organizational behavior that applies not only to post-disaster settings, but also to the multitude of other situations which require the interaction of organizations in achieving their goals. As our society is becoming more complex and interdependent, any sizeable human endeavor can only be accomplished through the combined efforts of a number of interacting organizations--a multiorganizational system. From health care delivery to the military-industrial complex, multiorganizational systems have become a social fact in modern society.

Mount St. Helens allowed us to take a close look at how a multiorganizational system emerges, how it first forms its structures and establishes its processes right from the beginning stages. Such emergence usually has escaped scientific scrutiny in the past.

We observed how a multiorganizational system has certain qualities in its own right--that it is not simply a larger organization composed of members from a number of smaller organizations. It is, therefore, not appropriate to automatically apply traditional concepts of organizational behavior to a multiorganizational system. With the Mount St. Helens data, we suggested that interorganizational authority is not the same as organizational authority. The relationship between coordination and control in a SAR system changes in going from an organizational to a multiorganizational system.

We also suggested that a multiorganizational system and an organization have many similarities. The concepts of boundary maintenance, socialization of members, external environment, and so on, do have relevance to both types of organizational phenomena.

Whether or not these findings hold true for other types of multiorganizational systems is a question to be addressed by future research. This study, together with the other five case studies in this research project, represent only a beginning to unraveling the complexity of interorganizational phenomena.

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