



BIBLIOGRAPHIC REFERENCE

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ABSTRACT

In 2006 a survey to assess individuals' understanding of and response to lahar hazards was undertaken in communities near Mt. Rainier volcano, Washington, U.S.A. This report presents a tabulated summary of the results from the survey and includes a brief discussion of the key findings.

KEYWORDS

Lahar hazards, survey, risk perception, Mt. Rainier, Washington.

1.0 INTRODUCTION

Mt. Rainier is a large, active volcano in Washington State, United States. While a variety of volcanic hazards at Mt Rainier threaten the region, there is more summit snow and ice cover on Mt. Rainier than on all other Cascade volcanoes combined, exacerbating the lahar hazard. During the past few thousand years, lahars reached the now densely populated Puget lowland at least every 500 to 1,000 years. As such, the lahar hazard at Mt. Rainier represents considerable risk to the region. For example, over 150,000 people reside on lahars from Mt. Rainier. Also, there is a one in seven chance (or greater) that a relatively small lahar with a return period of 500 years will occur during the average human lifetime (US Geological Survey, 2002).

A number of actions have been taken to mitigate the lahar hazard and its possible effects on downstream communities. One such mitigation measure includes the installation of an automated lahar detection system (consisting of Acoustic Flow Monitors) which triggers alerts when lahars are generated (U.S Geological Survey, 1999; Johnston et al., 2001a). In addition, the USGS, local educators, and emergency managers have been involved in a public education program with the intention of informing residents and visitors about volcano hazards, evacuation routes, and other appropriate response measures (Johnston et al., 2001a).

This report presents tabulated results from a community survey in 2006 and includes a brief discussion of the key findings.

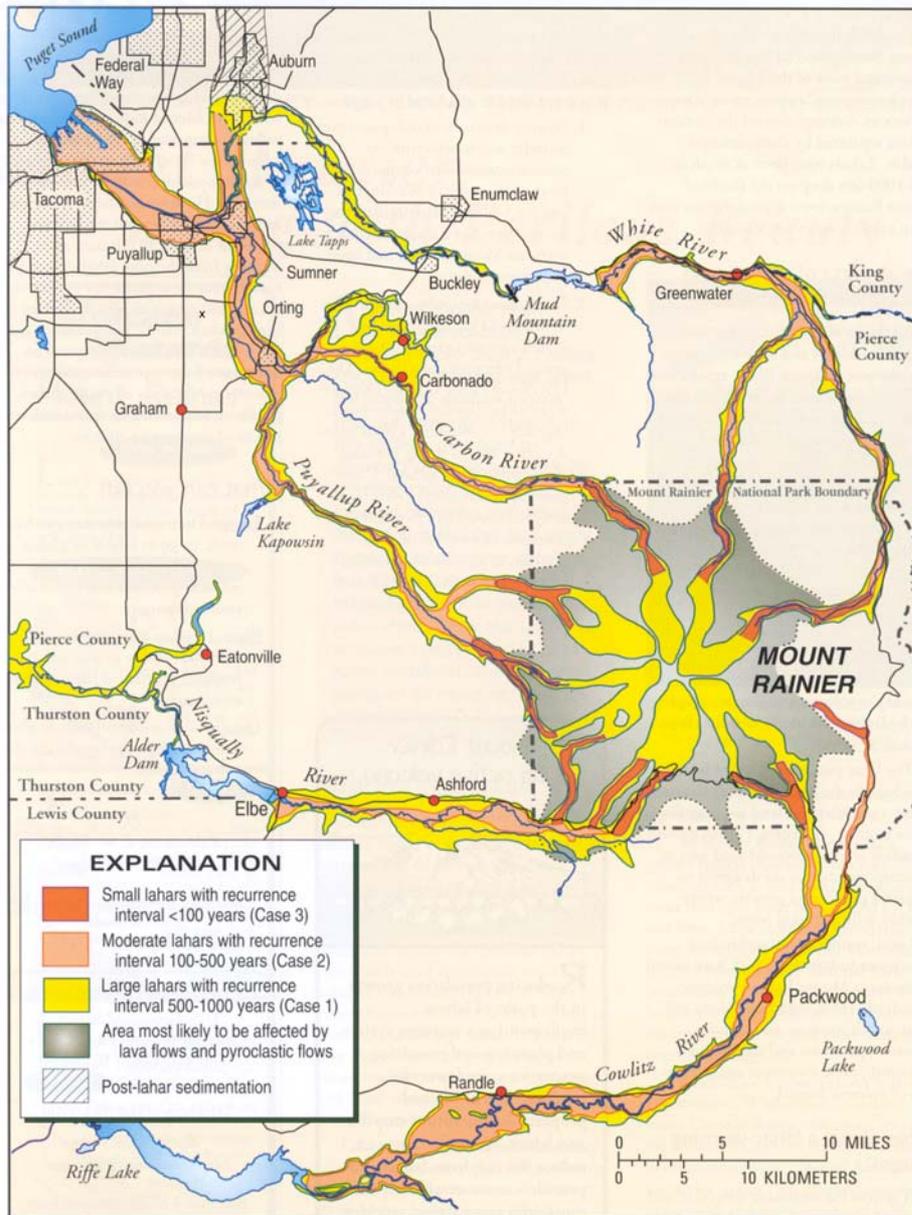


Figure 1 Location map of Mount Rainier. (Map courtesy of USGS).

2.0 SURVEY INSTRUMENT

A questionnaire was developed (appendix 1) to:

- quantify residents' knowledge of lahar hazards within the area in which they live;
- quantify their knowledge regarding the lahar warning system;
- identify the sources from whom lahar information was sought;
- quantify their perceptions of the consistency of this information and its influence on knowledge of warning systems;
- assess the effectiveness of hazard education initiatives in regard to promoting readiness to deal with lahar hazards and the anticipated effectiveness of warning systems; and
- provide a framework within which future readiness and warning intervention strategies can be systematically planned and administered.

3.0 PROCEDURE

A total of 850 survey packets were delivered to the Pierce County Department of Emergency Management on Friday, May 5, 2006. Each packet contained a cover letter and survey, as well as a business reply, postage-paid envelope in which respondents could mail their completed surveys back to the researchers. Each survey booklet had a number from 1 to 850 printed on the front cover. Survey instructions advised the respondents that the survey was anonymous and that they should not include any identifying information on the survey or on the return envelope.

On Monday, May 8 a two hour volunteer training session was held at the Department of Emergency Management. A total of 12 volunteers from the greater Tacoma area attended this session and the protocol for distributing the surveys was discussed at length. Volunteers were to canvass neighbourhoods in the greater Orting/Puyallup area and distribute surveys to randomly selected residential addresses. Volunteers were instructed not to leave surveys in mail boxes, but to distribute them person-to-person by knocking on doors. Additionally, questionnaires were to be distributed to the general public in this area at local events such Farmers Markets and from a booth set up at a local Safety Fair.

Volunteers were instructed to record the number found on each survey along with the residential address to which that particular survey was being delivered on a coding sheet, and these sheets were to be returned to the Pierce County DEM once all surveys had been distributed. In this way, the researchers would have a master list of all the residential addresses to which the surveys were distributed, and could

determine which addresses had or had not responded to the survey. In the event of a poor response rate this would allow for the potential for a later, follow-up mailing of additional surveys to those addresses that had not sent back their surveys. A total of 612 surveys were distributed in this manner between May 15 and July 30, 2006.

Due to the need for more volunteers, Pierce County DEM also contracted with the local chapter of the Americorps organization and arranged for another 100 surveys to be distributed by Americorps volunteers. These surveys were distributed according to the same protocols described above during the period between May 15 and June 15, 2006.

4.0 RESULTS

Sample Characteristics

Of the 712 distributed surveys, a total of 257 were completed and returned by September 15, 2006, representing an overall response rate of 36%. A breakdown of the number and percentage of responses by community and important demographic characteristics of the sample are presented below.

Number of Responses by Community

Community	N	Percent
Orting	115	44.7
Puyallup	72	28.0
Sumner	20	7.8
Edgewood	12	4.7
Tacoma	8	3.1
Bonney Lake	6	2.3
Graham	5	1.9
Eatonville	3	1.2
Milton	2	.8
Auburn	2	.8
Buckley	2	.8
Spanaway	1	.4
Kent	1	.4
Lake Tapps	1	.4
Missing/Unreported	7	2.7
Total	257	100.0

Gender

	N	Percent
Male	86	34
Female	168	65
Missing/Unreported	3	1
Total	257	100

Age

	N	Percent
Under 20 Years	2	1.0
21 – 30 Years	15	5.8
31 – 40 Years	57	22.2
41 – 50 Years	47	18.3
51 – 60 Years	49	19.1
61 – 70 Years	58	22.6
71 – 80 Years	23	8.9
81 Years and Above	6	2.3
Missing/Unreported	11	4.3
Total	257	100

Age Range: 18 – 87, Mean = 51.8 years, Standard Deviation = 15.2 years

Highest Level of Education Achieved

	N	Percent
High School	89	34.6
College Degree	119	46.3
Graduate Degree	35	13.6
Missing/Unreported	14	5.4
Total	257	100

Household Income Level

	N	Percent
Under \$25,000	15	5.8
\$25,001 - \$50,000	69	26.8
\$50,001 - \$75,000	78	30.4
\$75,001 - \$100,000	36	14.0
Over \$100,000	29	11.3
“Don't Know”	9	3.5
Missing/Unreported	21	8.2
Total	257	100

Race/Ethnicity

	N	Percent
White/Caucasian	244	94.9
Hispanic	1	.4
Asian	1	.4
African American	0	.0
Other	5	1.9
Missing/Unreported	6	2.3
Total	257	100

Home Ownership

	N	Percent
Own a House	233	90.7
Renting a House	11	4.3
Own a Condominium	3	1.2
Rent an Apartment	7	2.7
Missing/Unreported	3	1.2
Total	257	100

Length of Residency

	In State of Washington		Within Community		At Current Address	
	N	Percent	N	Percent	N	Percent
Under 5 Years	9	3.5	56	21.8	72	28.0
6 to 10 Years	10	3.9	30	11.7	32	12.5
11 to 20 Years	22	8.6	34	13.2	36	14.0
Over 20 Years	137	53.3	43	16.7	21	8.2
Missing/Unreported	79	30.7	94	36.6	96	37.4
Total	257	100	257	100	257	100

Survey Results

Survey responses are summarized below for each of the questions contained in the questionnaire. Numerical data are presented in table format; open ended responses are summarized in paragraph format.

1. Does your community have a lahar warning system?

	N	Percent
Yes	210	81.7
No	26	10.1
I Don't Know	20	7.8
Missing/Unreported	1	4.0
Total	257	100.0

2. As you understand it, how does the lahar warning system work?

(Open ended responses to this question were categorized. The number of responses that fall into each category are presented below.)

	N
Sirens/Alarms will go off when there's a need to evacuate	177
Sensors on Mt. Rainier will transmit signals to activate a warning	43
TV/Radio Will Provide Warning	19
Reverse 911 calls will alert people	4
Vague responses such as "a warning goes off"	18

3. How are you supposed to respond to a warning?

(Open ended responses to this question were categorized. The number of times each potential response was mentioned is tabulated and presented below.)

	N
"Go to higher ground"	95
"Evacuate via marked evacuation routes/follow signs"	51
"Evacuate" (with no details as to route or destination provided)	28
"Tune to TV or Radio for instructions and information"	18
"Evacuate" (with specific details of route and/or destination provided)	14
"Take emergency supplies"	14

4. Do you believe that the official evacuation routes in your community provide adequate means of evacuation or escape in the event of an actual lahar?

	N	Percent
Yes	79	30.7
No	143	55.6
I Don't Know	27	10.5
Missing/Unreported	8	3.1
Total	257	100

5. If you answered no to question 4, why do you feel that the official routes are inadequate for you?

(Open ended responses to this question were categorized. The number of times each response was mentioned is tabulated and presented below.)

	N
"Too many people/traffic/panic/too few routes"	117
"Existing bridges may be impassable"; there is no bridge"	9
"Routes are poorly marked"	5
"Evacuation route on foot is too far to walk"	4
"Disabled or elderly will not be able to walk"	3

6. Have you ever followed your community's official lahar evacuation route?

	N	Percent
Yes	137	53.3
No	115	44.7
Missing/Unreported	5	1.9
Total	257	100

7a. If you answered yes on Question 6, was this:

	N
During an official warning?	6
As part of an official training exercise?	37
Motivated by personal curiosity	62
Other	12
Total	117

7b. If you answered no on Question 6, why have you not followed an official evacuation route?

Due the complex responses to this question no categorization has been undertaken. A full list of responses is found in Appendix 2.

8. In the event of a lahar warning, have you ever considered following an evacuation route that is different from the official evacuation route for your community?

	N	Percent
Yes	116	45.1
No	134	52.1
Missing/Unreported	7	2.7
Total	257	100

9. If you have considered taking an evacuation route that is different from the official evacuation route, please explain your reason for doing so.

(Open ended responses to this question were categorized. The number of times each response was mentioned is tabulated and presented below.)

	N
"Official routes will be too congested"	60
"Alternate route is faster/closer/safer/easier"	26
"Depends on where I am; want to have other alternatives"	7
"Alternate route doesn't require car"	6
"Official route takes me in a direction I don't want to go"	3

10. Have you ever tested any unofficial evacuation routes (for example by driving or walking them)?

	N	Percent
Yes	79	30.9
No	177	68.9
Missing/Unreported	1	.4
Total	257	100

11. If you answered yes on Question 10, was this: (check as many as apply)

	N
During an official lahar warning	3
As part of an official lahar training exercise	2
Something you did on your own	67
Drive this route regularly	4
Other	4
Total	72

12. Have you stored personal belongings to take with you when a lahar warning is issued?

	N	Percent
Yes	83	32.2
No	174	67.7
Total	257	100

13. If yes on Question 12, please list the most important items you have.

(Open-ended responses have been categorized and tabulated below)

Items Mentioned	N
Water	60
Food/canned goods	55
Spare clothes/shoes	46
Blankets/Camping Supplies	36
Flashlight	31
First Aid/Emergency Kit	31
Important Documents/Papers	25
Medications	23
Radio	20
Cash/Checkbook	14
Personal Photos	9
Other/Miscellaneous (pet food, batteries, jewellery, etc.)	60

14. If you hear an actual lahar warning in the future, how do you intend to evacuate?

	N	Percent
By Car	171	66.5
On Foot	48	18.7
By Bicycle	19	7.4
Other ** (see below)	19	7.4
Total	257	100

If "Other", please specify:

Other Responses **	N
Motorhome/RV	4
Motorcycle/Quad	2
Depends where I am	8
Stay put; I live on high ground	8
Horseback	1
Other/Unable to Categorize	4

15. Will you need help to evacuate?

	N	Percent
Yes	10	3.9
No	219	85.2
I Don't Know	26	10.1
Missing/Unreported	2	.8
Total	257	100

16. If you answered yes to Question 15, please describe what help you will need.

	N
Disability	5
Small Children	3
Transportation	3
More Evacuation Routes	1
Helicopter	1
Other/Unable to categorize	2

17. Please describe the extent to which you agree or disagree with each of the following statements (1 = strongly agree, 5 = strongly disagree).

I believe that a damaging lahar is likely to occur:		N	Percent
Within the next 12 months M = 4.14, SD = 1.02	Strongly Agree	7	3.1
	Agree	2	.9
	Neither Agree nor Disagree	53	23.8
	Disagree	51	22.9
	Strongly Disagree	110	49.3
Total	223	100.0	
Within the next 1 to 5 years M = 3.68, SD = 1.04	Strongly Agree	7	3.1
	Agree	12	5.3
	Neither Agree nor Disagree	89	39.6
	Disagree	54	24.0
	Strongly Disagree	63	28.0
Total	225	100.0	
5 to 10 years from now M = 3.28, SD = 1.08	Strongly Agree	9	4.0
	Agree	40	17.8
	Neither Agree nor Disagree	97	43.1
	Disagree	37	16.4
	Strongly Disagree	42	18.7
Total	225	100.0	
More than 10 years from now M = 2.31, SD 1.18	Strongly Agree	80	33.7
	Agree	48	20.3
	Neither Agree nor Disagree	79	33.3
	Disagree	16	6.8
	Strongly Disagree	14	5.9
Total	237	100.0	

18. How often do you:

		N	Percent
Think about lahars?	Once a week or more	48	18.7
	Once a month	39	15.2
	A few times a year	94	36.5
	Rarely	66	25.7
	Never	10	3.9
Total	257	100.0	
Talk about lahars?	Once a week or more	26	10.4
	Once a month	36	14.5
	A few times a year	106	42.6
	Rarely	68	27.3
	Never	13	5.2
Total	251	100.0	

19. If you do think or talk about lahars, what sort of things do you think or talk about?

Due the complex responses to this question no categorization has been undertaken. A full list of responses is found in Appendix 2.

20. Please describe the extent to which you agree or disagree with each of the following statements: (1 = strongly agree, 5 = strongly disagree)

		N	Percent
Lahars pose a threat to my personal safety	Strongly Agree	93	36.6
	Agree	53	20.8
	Neither Agree nor Disagree	46	18.0
	Disagree	42	16.5
	Strongly Disagree	21	8.2
M = 2.39, SD = 1.34	Total	255	100.0
Lahars pose a threat to my home or property	Strongly Agree	106	41.7
	Agree	39	15.4
	Neither Agree nor Disagree	38	15.0
	Disagree	28	11.0
	Strongly Disagree	43	16.9
M = 2.46, SD = 1.53	Total	254	100.0
Lahars pose a threat to personal safety of most residents of my community	Strongly Agree	112	43.9
	Agree	51	20.0
	Neither Agree nor Disagree	43	16.9
	Disagree	33	12.9
	Strongly Disagree	16	6.3
M = 2.18, SD = 1.29	Total	255	100.0
Lahars pose a threat to homes or property of most community residents	Strongly Agree	115	45.3
	Agree	50	19.6
	Neither Agree nor Disagree	39	15.4
	Disagree	31	12.2
	Strongly Disagree	19	7.5
M = 2.17, SD = 1.32	Total	254	100.0
Lahars pose a threat to daily activities in my community	Strongly Agree	102	40.2
	Agree	44	17.3
	Neither Agree nor Disagree	43	16.9
	Disagree	35	13.8
	Strongly Disagree	30	11.8
M = 2.40, SD 1.43	Total	254	100.0

21. Please describe the extent to which you agree or disagree with each of the following statements: (1 = strongly agree, 5 = strongly disagree)

		N	Percent
I have the knowledge and skills to insure that I am prepared for emergency situations	Strongly Agree	57	22.4
	Agree	93	36.4
	Neither Agree nor Disagree	79	31.0
	Disagree	19	7.5
	Strongly Disagree	7	2.7
M = 2.32, SD = .99	Total	255	100.0
I have the ability to protect myself and/or my family from the effects of a lahar.	Strongly Agree	33	12.9
	Agree	78	30.6
	Neither Agree nor Disagree	93	36.5
	Disagree	31	12.2
	Strongly Disagree	20	7.8
M = 2.71, SD = 1.09	Total	255	100.0
I am confident that I will be able to successfully evacuate when a lahar warning is issued.	Strongly Agree	43	16.9
	Agree	76	29.8
	Neither Agree nor Disagree	89	34.8
	Disagree	30	11.8
	Strongly Disagree	17	6.7
M = 2.62, SD = 1.10	Total	255	100.0

22. In the next month or so, do you intend to: (1 = extremely unlikely, 5 = extremely likely)

		N	Percent
Become involved with a local group to discuss how to improve the response to a lahar	Extremely Unlikely	84	33.3
	Unlikely	41	16.3
	Neither Likely or Unlikely	61	24.2
	Likely	33	13.1
	Extremely Likely	33	13.1
M = 2.56, SD = 1.40	Total	252	100.0
Seek information on lahar risk	Extremely Unlikely	71	28.1
	Unlikely	54	21.3
	Neither Likely or Unlikely	72	28.5
	Likely	35	13.8
	Extremely Likely	21	8.3
M = 2.53, SD = 1.26	Total	253	100.0
Seek information about the lahar warning system in my community	Extremely Unlikely	71	28.0
	Unlikely	56	22.0
	Neither Likely or Unlikely	70	27.6
	Likely	33	13.0
	Extremely Likely	24	9.4
M = 2.54, SD = 1.28	Total	254	100.0
Seek information about evacuation routes for my community	Extremely Unlikely	61	24.0
	Unlikely	62	24.5
	Neither Likely or Unlikely	61	24.0
	Likely	41	16.1
	Extremely Likely	29	11.4
M = 2.67, SD = 1.31	Total	254	100.0

23. Please rate (from 1 = not at all prepared to 5 = very prepared) the extent to which you perceive each of the following is prepared to deal with a lahar:

		N	Percent
How prepared do you think you are for a major lahar?	Not at all Prepared	34	13.3
	Somewhat Prepared	55	21.5
	Neither Prepared nor Unprepared	96	37.5
	Somewhat Prepared	59	23.0
	Very Prepared	12	4.7
M = 2.84, SD = 1.07	Total	256	100.0
How well prepared do you think other members of your community are for a major lahar?	Not at all Prepared	47	18.7
	Somewhat Prepared	103	40.9
	Neither Prepared nor Unprepared	83	32.9
	Somewhat Prepared	18	7.1
	Very Prepared	1	.4
M = 2.30, SD = .87	Total	252	100.0
How well prepared do you think local officials are for a major lahar?	Not at all Prepared	35	13.8
	Somewhat Prepared	66	26.1
	Neither Prepared nor Unprepared	89	36.2
	Somewhat Prepared	50	19.8
	Very Prepared	13	5.1
M = 2.76, SD = 1.08	Total	253	100.0

24. Please read each of the following statements and describe the extent to which you agree or disagree with each: (1 = Strongly Agree; 5 = Strongly Disagree).

		N	Percent
There may be lahars, but they won't be that bad	Strongly Agree	7	2.8
	Agree	18	7.3
	Neither Agree nor Disagree	74	29.8
	Disagree	77	31.1
	Strongly Disagree	72	29.0
M = 2.46, SD = 1.53	Total	248	100.0
The location of the lahars will be far away from here and have little impact on us	Strongly Agree	6	2.4
	Agree	24	8.7
	Neither Agree nor Disagree	40	16.1
	Disagree	64	25.8
	Strongly Disagree	114	46.0
M = 2.46, SD = 1.53	Total	248	100.0
The likelihood that major lahars will occur here has been greatly exaggerated	Strongly Agree	17	6.8
	Agree	19	7.6
	Neither Agree nor Disagree	72	28.8
	Disagree	66	26.4
	Strongly Disagree	76	30.4
M = 2.18, SD = 1.29	Total	250	100.0
I have been fine during the lahars we have had and I will be fine in the next one too	Strongly Agree	11	5.3
	Agree	18	8.7
	Neither Agree nor Disagree	60	29.1
	Disagree	30	14.6
	Strongly Disagree	87	42.2
M = 2.17, SD = 1.32	Total	206	100.0

25. In regard to living in this community generally, please describe the extent to which you agree or disagree with each statement (1 = strongly agree, 5 = strongly disagree; lower numbers = stronger community bonds).

		N	Percent
I feel like I belong in this community	Strongly Agree	117	46.8
	Agree	72	28.8
	Neither Agree nor Disagree	51	20.4
	Disagree	8	3.2
	Strongly Disagree	2	.8
M = 1.82, SD = .92	Total	250	100.0
I believe my neighbours would help me in an emergency	Strongly Agree	111	44.2
	Agree	70	27.9
	Neither Agree nor Disagree	49	19.5
	Disagree	18	7.2
	Strongly Disagree	3	1.2
M = 1.93, SD = 1.02	Total	251	100.0
Even if I had the opportunity I would not move out of this community	Strongly Agree	89	35.4
	Agree	51	20.3
	Neither Agree nor Disagree	52	20.7
	Disagree	29	11.6
	Strongly Disagree	30	12.0
M = 2.44, SD = 1.38	Total	251	100.0
I feel loyal to the people in my community	Strongly Agree	89	35.4
	Agree	71	20.3
	Neither Agree nor Disagree	63	20.7
	Disagree	14	11.6
	Strongly Disagree	4	12.0
M = 2.02, SD = 1.01	Total	251	251
I often have friends over to my house to see me	Strongly Agree	80	39.4
	Agree	67	28.3
	Neither Agree nor Disagree	68	25.1
	Disagree	26	5.6
	Strongly Disagree	10	1.6
M = 2.28, SD 1.14	Total	251	100.0
I plan to remain a resident of this community for a number of years	Strongly Agree	126	50.4
	Agree	57	22.8
	Neither Agree nor Disagree	39	15.6
	Disagree	12	4.8
	Strongly Disagree	16	6.4
M = 1.94, SD 1.20	Total	250	100.0

26. Thinking about what you have heard about lahar hazards affecting your community, how consistent was this information? (Please check only one)

	N	Percent
Consistent	75	31.1
Fairly Consistent	98	40.7
Unsure	34	14.1
Fairly Inconsistent	16	6.6
Inconsistent	0	0.0
I haven't heard anything	18	7.5
Total	241	100.0

27. The following activities help minimize disruption to a community if lahars occur. Please record whether they currently apply to your community.

		N	Percent
Does your neighbourhood have a lahar evacuation plan?	Yes	108	42.0
	No	66	25.7
	I Don't Know	70	27.2
	Missing/Unreported	13	5.1
	Total	257	100.0
Have you been involved in meetings on lahar response in your local community?	Yes	85	33.1
	No	160	62.3
	I Don't Know	2	.8
	Missing/Unreported	10	3.9
	Total	257	100.0
Have you discussed the need for lahar response with your neighbours?	Yes	88	34.2
	No	153	59.5
	I Don't Know	6	2.3
	Missing/Unreported	10	3.9
	Total	257	100.0
Have you discussed the need for lahar response with official agencies?	Yes	66	25.7
	No	171	66.5
	I Don't Know	8	3.1
	Missing/Unreported	12	4.7
	Total	257	100.0

28. Do you have a child in school (K-12)?

	N	Percent
Yes	76	29.6
No	175	68.1
Missing/Unreported	6	2.3
Total	257	100.0

29. If you answered yes to Question 28, does your child's school have a lahar evacuation plan?

	N	Percent
Yes	69	73.4
No	8	8.5
I Don't Know	17	18.1
Total	94	100.0

30. If you answered yes to Question 29, please describe the extent to which you agree or disagree with each of the following statements: (1 = strongly agree, 5 = strongly disagree)

		N	Percent
I trust the evacuation plan at my child's school to protect my child during lahars	Strongly Agree	12	15.8
	Agree	15	19.7
	Neither Agree nor Disagree	25	32.9
	Disagree	11	14.5
	Strongly Disagree	13	17.1
M = 2.97, SD = 1.30	Total	76	100.0
I am likely to allow my child to remain at school when a lahar warning is issued	Strongly Agree	9	12.3
	Agree	13	17.8
	Neither Agree nor Disagree	14	19.2
	Disagree	12	16.4
	Strongly Disagree	25	24.2
M = 3.42, SD = 1.43	Total	73	100.0
I am likely to go and get my child from school if a lahar warning is issued	Strongly Agree	18	25.0
	Agree	10	13.9
	Neither Agree nor Disagree	21	29.2
	Disagree	14	19.4
	Strongly Disagree	9	12.5
M = 2.81, SD = 1.35	Total	72	100.0

5.0 KEY FINDINGS

This report presents a preliminary summary of the results from the 2006 community survey. Key findings related to residents' familiarity with, and confidence in, the warning and evacuation procedures, perceptions of risk regarding lahar hazards, and feelings of preparedness for the threat are summarized below:

Awareness of, and Confidence in, Warning & Evacuation Plans

- While the vast majority (82%) of respondents know that their community has a warning system in place, and many residents know the basic elements of the warning system, in open-ended responses many residents say that there are no warning sirens in their immediate area, or that they cannot hear the sirens from their homes.
- Regarding evacuation, 56% of respondents stated that the official evacuation routes in their community do not provide an adequate means of escape in the event that a warning is issued. Furthermore, 45% said that they have considered using an evacuation route different from the one outlined in the official plan. By far the most common reason for considering alternate routes is fear of traffic jams, panic, and congestion when trying to use official evacuation routes. Others stated that they know other routes that will be faster or shorter than the official routes.
- Regarding the means by which people intend to evacuate, 66% say they will go by car, 19% on foot, 7% by bicycle, with another 8% either naming some other method, or saying that it would depend upon where they were when the warning was issued. A small number of respondents (4%) said that they will need help to evacuate, and another 10% were unsure of whether they might need help. The major reasons cited for needing help were disabilities, the presence of small children, or transportation issues.
- Of those residents who have children in school in grades K – 12, 27% said that they did not know if their child's school has an evacuation plan, and of those who were aware of such a plan, only 35% express trust in this plan. An important finding to note in this regard is that approximately 40% of these individuals said they would not allow their children to stay at school and would come to get their child in the event that a lahar warning were issued.

Perceptions of Risk for the Lahar Hazard

- In general, the respondents seem to have a realistic perspective regarding the risks that lahars may pose to their safety: anywhere from 55 - 65% of residents believe that lahars do pose a threat to their personal safety, to their home and property, and to their community.
- However, the threat is not terribly salient in the minds of the sample; only 34% of respondents said they think about the risk once a month or more, and 29% said they think about lahars rarely or never. This may be related to respondents' perceptions of when a lahar is likely to affect their community: only 4% stated that they think there will be a lahar within the next year, while 54% say that a lahar is likely to occur more than 10 years from now. Therefore, while they recognize the danger, they tend to perceive it as a rather distant or far off event in terms of when it might impact their everyday lives.
- Denial of the risk or the belief that the risk may be exaggerated were not common reactions; approximately 10% of respondents stated that if there is a lahar it "won't be so bad", or that they think they are unlikely to be affected by a lahar if one occurs. Only 14% said that they think the risk from lahars has been exaggerated.
- While almost 60% of respondents believe they have the skills and knowledge to prepare for lahar hazards, fewer believe that they will be able to evacuate successfully (47%) or that they have the ability to protect themselves from lahars (43%). It seems that while many people feel that they know what to do, fewer have confidence in their ability to translate that knowledge into action.
- Only 28% of those who responded to the survey feel that they are prepared for a major lahar; even fewer believe that local officials are prepared (25%), but interestingly, only 8% stated that the residents of their community are prepared for a lahar. These results display a common pattern seen in the assessment of risk known as "optimistic bias", in which we rate our own risk as less than that of the "typical" or "average" person.

Preparedness and Information Seeking Behaviour

- Only 32% of those sampled say they have stored belongings in preparation for a potential emergency. Water, food, spare clothing, camping supplies, first aid kits, flashlights, and medications are among the most commonly reported items.

- Similarly, only 33 – 34% of respondents have attended community meetings or have talked with neighbours about how to react to a lahar warning.
- Finally, relative low numbers of people stated that they intend to seek more information about their risk (22%), about the warning system (22%), or about evacuation routes in their community (27%).

6.0 REFERENCES

- Johnston, D.M.; Paton, D.; Driedger, C.; Houghton, B.; Ronan, K. (2001)a. Student perceptions of hazards at four schools near Mount Rainier, Washington, USA. *Journal of the American Society of Professional Emergency Planners*. 8, p. 41-51.
- Johnston, D., Driedger, C., Houghton, B., Ronan, K., Paton, D. (2001)b. Children's risk perceptions and preparedness: A hazard education assessment in four communities around Mount Rainier, USA – Preliminary results. *Institute of Geological and Nuclear Sciences Science Report 2001/02*.
- U.S. Geological Survey (1999) Mount Rainier Volcano Lahar Warning System: http://volcanoes.usgs.gov/About/Highlights/RainierPilot/Pilot_highlight.html
- U.S. Geological Survey (2002). Mount Rainier—Learning to live with volcanic risk. 034-02.
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APPENDIX 1

QUESTIONNAIRE

Mount Rainier Lahar Survey

Involving the community in emergency preparedness



Questionnaire

Mount Rainier is an active volcano that poses a risk to several communities located around its base. Lahars, or volcanic mudflows, are one of the main hazards from volcanoes, and authorities have developed a lahar warning system to protect communities in the path of lahars. This questionnaire aims to help improve community safety by giving us a better understanding of how residents see the risk, and how they plan to respond in the event of a lahar warning.

To collect information on understanding and preparedness for a lahar event, surveys are being distributed to a random sample of 1000 households in your community. Your participation in this survey will help ensure that future public information campaigns can be targeted to meet the needs of your community.

A report summarizing the findings of this survey will be available through the local Emergency Management Office, and will be provided to the local newspaper for publication. To meet our institutional and professional ethical obligations, the data will be stored for five years in a locked storage area, and all raw data will then be destroyed at the end of that period.

Your participation in this study is entirely voluntary, and you may elect to refuse to answer any question on the survey or choose to withdraw from the study at any time (i.e., not fill out and/or choose not to return the survey). The survey does not ask for any identifying information; the researchers will not know your identity. As a result, there is no way in which your responses will be identifiable in any research output including conference presentations and published research reports in academic and professional journals.

Should you wish to find out any additional information regarding this study, please do not hesitate to contact any of the research team:-

Matt Davis, Dominican University of California, (MDavis@dominican.edu)

David Johnston, GNS Science, (david.johnston@gns.cri.nz)

Julia Becker, GNS Science (j.becker@gns.cri.nz)

Additionally, please contact Pierce County, Department of Emergency Management (Tel (253) 798-6595) should there be any concerns about the nature and/or conduct of this research project.

Your return of the enclosed survey will be taken as indicative of your having read the information sheet and of your agreement to participate in this study.

1. Does your community have a lahar warning system?

- 1 Yes
- 2 Don't know (*skip to 3*)
- 3 No (*skip to 3*)

2. As you understand it, how does the lahar warning system work? (*please be specific*)

3. How are you supposed to respond to a warning? (*please be specific*)

4. Do you believe that the official evacuation routes in your community provide adequate means of evacuation or escape in the event of an actual lahar?

- 1 Yes (*go to question 6*)
- 2 No (*go to question 5*)
- 3 Don't know

5. If you answered no to question 4, why do you feel that the official routes are inadequate for you?

6. Have you ever followed your community's official lahar evacuation route?

- 1 Yes (*go to question 7*)
- 2 No (*if no, skip to 7a*)

7. If yes, was this:

- 1 During an official warning
- 2 As part of an official training exercise
- 3 Motivated by personal curiosity
- 4 Other _____

7a. If no, why have you not followed an official evacuation route?

8. In the event of a lahar warning, have you ever considered following an evacuation route that is different from the official evacuation route for your community?

- 1 Yes
- 2 No (*skip to 10*)

9. If you have considered taking an evacuation route that is different from the official evacuation route, please explain your reason for doing so:

10. Have you ever tested any unofficial evacuation routes? (for example by driving or walking them)?

- 1 Yes
- 2 No (*skip to 12*)

11. If yes, was this? (check as many as apply)

- 1 During an official lahar warning
- 2 As part of an official lahar training exercise
- 3 You did it on your own (*not as part of a warning or exercise*)
- 4 Other (*please specify*) _____

12. Have you stored personal belongings to take with you when a lahar warning is issued?

- 1 Yes
- 2 No (*skip to 14*)

13. If yes, please list the most important items you have stored.

1 _____	5 _____
2 _____	6 _____
3 _____	7 _____
4 _____	8 _____
Other _____	

14. If you were to hear an actual lahar warning in the future, how do you intend to evacuate?

- 1 By car
- 2 By foot
- 3 By bicycle
- 4 Other (*please specify*) _____

15. Will you need help to evacuate?

- 1 Yes
- 2 No (*skip to question 17*)
- 3 Don't know (*skip to question 17*)

16. If yes, please describe what help you will need:

17. Please describe the extent to which you agree or disagree with each of the following statements.

I believe that a damaging lahar is likely to occur: (*for each line check one box which best indicates your opinion*)

	Strongly agree ← (scale) → Strongly disagree				
	□ ₁	□ ₂	□ ₃	□ ₄	□ ₅
Within the next 12 months	□ ₁	□ ₂	□ ₃	□ ₄	□ ₅
Within the next 1 to 5 years	□ ₁	□ ₂	□ ₃	□ ₄	□ ₅
5 to 10 years from now	□ ₁	□ ₂	□ ₃	□ ₄	□ ₅
More than 10 years from now	□ ₁	□ ₂	□ ₃	□ ₄	□ ₅

18. How often do you: (for each line check one box which best indicates your opinion)

	Once a week or more	Once a month	A few times a year	Rarely	Never
Think about lahars	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Talk about lahars	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

19. If you do think or talk about lahars, what sort of things do you think or talk about?

20. Please describe the extent to which you agree or disagree with each of the following statements: (for each line check one box which best indicates your opinion)

	Strongly agree ← (scale) → Strongly disagree				
Lahars pose a threat to my personal safety	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Lahars pose a threat to my home or property	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Lahars pose a threat to the personal safety of most residents in my community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Lahars pose a threat to the homes or property of most residents in my community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Lahars pose a threat to daily life activities (e.g. work, leisure) in my community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

21. Please describe the extent to which you agree or disagree with each of the following statements: (for each line check one box which best indicates your opinion)

	Strongly agree ← (scale) → Strongly disagree				
I have the knowledge and skills to insure that I am prepared for emergency situations	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I have the ability to protect myself and/or my family from the effects of a lahar.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I am confident that I will be able to successfully evacuate to a safe place when a lahar warning is issued.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

22. In the next month or so, do you intend to: (for each line check one box which best indicates your opinion)

	Extremely unlikely ← (scale) → Extremely likely				
Become involved with a local group to discuss how to improve the response to a lahar	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Seek information on lahar risk	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Seek information about the lahar warning system in my community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Seek information about evacuation routes for my community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

23. Please rate (from 1 = not at all prepared to 5 = very prepared) the extent to which you perceive each of the following is prepared to deal with a lahar: (for each line check one box which best indicates your opinion)

	Not at all prepared ← (scale) → Very prepared				
How prepared do you think you are for a major lahar?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
How well prepared do you think other members of your community are for a major lahar?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
How well prepared do you think local officials are for a major lahar?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

24. Please read each of the following statements and describe the extent to which you agree or disagree with each: (for each line check one box which best indicates your opinion)

	Strongly agree ← (scale) → Strongly disagree				
There may be lahars, but they won't be that bad	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
The location of the lahars will be far away from here and have little impact on us	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
The likelihood that major lahars will occur here has been greatly exaggerated	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I have been fine during the lahars we have had and I will be fine in the next one too	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

25. In regard to living in this community generally, please describe the extent to which you agree or disagree with each statement (for each line check one box which best indicates your opinion)

	Strongly agree ← (scale) → Strongly disagree				
I feel like I belong in this community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I believe my neighbors would help me in an emergency	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
Even if I had the opportunity I would not move out of this community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I feel loyal to the people in my community	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I often have friends over to my house to see me	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I plan to remain a resident of this community for a number of years	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

26. Thinking about what you have heard about lahar hazards affecting your community, how consistent was this information? (please check only one)

- 1 I have not heard anything
- 2 Consistent
- 3 Fairly consistent
- 4 Unsure
- 5 Fairly inconsistent
- 6 Inconsistent

27. The following activities help minimize disruption to a community if lahars occur. Please record whether they currently apply to your community (for each line check one box which best indicates your opinion)

	Yes	Don't know	No
Does your neighborhood have a lahar evacuation plan?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Have you been involved in any meetings on lahar response in your local community?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Have you discussed the need for lahar response with your neighbors?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Have you discussed the need for lahar response with official agencies?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃
Have you discussed the need for lahar response with others (please specify who these people are)	<hr/> <hr/> <hr/>		

28. Do you have a child in school (K 1-12)?

- ₁ Yes
₂ No (skip to question 32)

29. Does your child's school have a lahar evacuation plan?

- ₁ Yes
₂ No (skip to question 31)
₃ Don't know (skip to question 31)

30. If yes, please describe the extent to which you agree or disagree with each of the following statements: (for each line check one box which best indicates your opinion)

	Strongly agree ← (Scale) → Strongly disagree				
I trust the evacuation plan at my child's school to protect my child during lahars	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I am likely to allow my child to remain at school when a lahar warning is issued	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
I am likely to go and get my child from school if a lahar warning is issued	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

31. How long have you lived in the following places:

- a. Washington State _____years
- b. The community you live in now _____years
- c. Your current residence _____years

32. Which best describes the situation where you live?

- 1 We own our house
- 2 We rent a house
- 3 We own a condominium or townhouse
- 4 We rent an apartment
- 5 Don't know

33. What is your age: _____years

34. Gender:

- 1 Male
- 2 Female

35. Which of the following best reflects your ethnicity?

- 1 White
- 2 American Indian or Alaska Native (write in tribe) _____
- 3 Black, African American
- 4 Hispanic (of any race or nationality)
- 5 Asian
- 6 Other _____

36. Which of the following categories do you think best describes your yearly household income (before taxes):

- 1 \$0 - \$25,000 _____
- 2 \$25,001 - \$50,000 _____
- 3 \$50,001 - \$75,000 _____
- 4 \$75,001 - \$100,000 _____
- 5 over \$100,000 _____
- 6 Don't know _____

37. Which best reflects the highest level of education that you completed?

- 1 Elementary school (grades 1-6)
- 2 Junior High or Middle School (grades 7-8)
- 3 High School (grades 9-12)
- 4 College Degree (2 or 4 year degree)
- 5 Graduate Degree (Masters, Ph.D., etc)

**Thank you for filling in this questionnaire.
The information will help us make
your community more prepared for lahars.**

**Please return this questionnaire
in the supplied postage paid envelope.**



APPENDIX 2

Question 7a

If no, why have you not followed an official evacuation route?

- Accidental warning system
- Drive it every day
- Drive route
- Drive that way all the time
- Driving by - signs are in the only 4 roads out of town
- During false alarm
- Evacuate route is also my regular route out of town
- False alarm
- False alarm set off by news station
- I go that way often in daily life
- I travel it frequently
- I travel that way often
- I work during the alarms
- It's on my way to school
- It was on my way somewhere
- Just driving along the route
- Main road
- Normal roads I travel constantly
- Normal route I drive daily
- Normal routes
- One way out of town
- Regular driving route
- Regular route out of town
- Routine travel
- School drill
- Shortcut to neighbouring city
- Siren went off when there was a non-event
- To see if we could get out, it's not likely people will panic. Roadways full
- Travel daily along route
- Wanted to know school evacuation route
- We go that way regularly
- We leave town daily
- Yes
- You have to drive it to get out of town
- A bit too old & bad legs
- Am I supposed to do this for kicks on my own time, or is there a field trip? I guess I could pack a picnic & check it out. (It never occurred to me)
- At work during tests
- Because I have no car
- Because I know where the route is and I don't believe if a lahar happened that this route would be sufficient
- Because I live near the end of the evacuation route
- Because it's silly. Can you imagine 15,000 people all trying to use the same evacuation route? They're a joke
- Because my child is opposite of my evacuation route
- Currently there is no route where I work (Auburn) or where I live (Bonney Lake)
- Did not have transportation - cannot drive – handicapped - can't walk more than a block
- Did not participate in the drill with the school. Live outside city limits.
- Didn't know we had one
- Do not know where it is
- Do not live in the valley. I am a frequent visitor to Orting
- Don't even know if my city has one
- Don't know exactly where it is

- Don't know the route
- Don't know what it is
- Don't know what the route is. A map should be prepared by community
- Don't know where the routes are located
- Don't live in Puyallup/Orting etc areas live in 98418
- Don't really know what it is for me
- Have not been in an official drill or had curiosity enough to travel the routes
- Have not taken the time. But I and my family will now made a dry run
- Have not thought about it
- Have only seen two signs
- Haven't had one just moved here
- Haven't needed to evacuate
- Haven't run out of other things to do-gas too expensive just to drive around
- Haven't taken the time to do so
- Haven't thought about it - why worry unnecessarily
- Haven't thought about it
- I've never taken the time to do it
- I've seen the signs but didn't feel the need to "practice"
- I've seen the signs, just never went
- I am aware it and know how to get there
- I am definitely aware of the route, so there's no need
- I am new to this area
- I am on high ground & unless I am in the valley I will be ok
- I didn't know until recently that we shouldn't just drive up the hill
- I do not believe driving out will work
- I don't live in the lahar zone - on a hill
- I drive them normally
- I followed it with the school and the school only did part of it
- I guess I drive that way during errands, but I've never driven it with the purpose to "try it out"
- I have seen the signs + know the direction to go
- I have a much shorter route to high ground
- I have had no need to
- I have seen signs along different routes of travel
- I know the city
- I know the evacuation route well
- I know what & where I will go
- I know where it goes
- I know where it is but have not walked it
- I know where the roads go already
- I know where they already lead to
- I live on higher ground - and each day I drive the route from Sumner to my home
- I never think of it
- Just have never taken the time
- Know the routes up hill already, can't depend on them to be open anyway
- My home is on the ridge-outside of the danger zone
- Never been around during a test
- Never been asked to do so
- Never been asked to participate
- Never been involved with schools and that is the only venue practicing the route, as far as I know
- Never given one or had a practice with everyone on the road at once
- Never had to evacuate only have lived here since 1997
- Never hear it go off
- Never heard one
- Never occurred to me
- Never thought of it - just moved into area
- Never thought to b/c we live in a 'safe' area
- Never took the time. I'm aware of it though
- No need
- No need to

- No point trying it when the traffic conditions won't be the same as they would be in a real evacuation
- No reason
- No reason to up to now
- No reason. We go that way when shop so didn't think we needed to do a specific "run"
- No sense of urgency and time constraints
- Not curious enough
- Not here during test
- Not in a lahar area during warning
- Not many around my home have seen the signs in the valley & I do know to go to higher ground
- Not motivated by personal curiosity
- Not really sure which way to head from my home address or work address
- Not really worried about-gue cera cera!
- Not worried and I am home and safe most of time
- Nothing official, just general evacuation route. Head to nearest hill & go up
- On own since because we have never had a practice to do so
- Out of town when our community went
- Still undecided as to the most effective route to use
- The false alarm that occurred - we found out it was a false alarm
- There are only a few ways out of town & uphill. I am familiar with them
- There has been no community action except for schools
- There is none for my community
- There is none where I live - told it is unneeded
- There is not one physically in place
- There is only 1 way out of our town
- Until the mountain shows some signs, like Mt St Helens, I'm not too worried
- We're only been here 1 yr
- We already live on higher ground, we do bike in area that would be affected
- We are not aware of an official evacuation route
- We don't live near an official route
- We live on South Hill, which is out of the path of a lahar
- We live on the hill and know all the routes from the valley up the hill
- When I was in Orting visiting a friend, I did not think to check out the route
- When warning goes off I do not practice - will walk/drive to higher ground

Question 19

If you do think or talk about lahars, what sort of things do you think or talk about?

- 1. Evacuation. 2. Likelihood of actual lahar. 3. That we'll have plenty of warning prior because I was here when Mt St Helens erupted and everyone had plenty of time & warning to evacuate
- 1. How easily the earth could give way-even by a spring rain. 2. Past debris flows (1999 Aug). 3. How I now feel hesitant to visit My Rainer unless I have emergency equipment in the car
- 1. How inadequate the warning system is - several false alarms. 2. Lack of community practice & co-ordination. 3. Lack of community knowledge not to go by car
- 1. How long it would take to get out. 2. How awful for everything to be covered in lava - our beautiful valley!
- 1. The likelihood of it happening. 2. The likely traffic jam if it does happen
- About all the traffic & how very few will escape
- About how fearful people are
- About how much time we have to evacuate & the means of transportation - best to walk due to congestion
- About the inability to reach higher ground before being buried, and talking to kids about the evacuation procedures at school
- All it takes is an ice jam or rock slide, even on an a little creek to bring much added flow to a river.
- All the media Orting receives because of the mountain. News trucks are down here often
- Alternate evacuation routes
- Amount of time needed to safety evacuate. Route 162 too narrow for city's population
- Annual math problem at school for preparation for WASL Assessments
- Any "indigitious" from the mountain. Plans using "what if statements"
- Are we really prepared
- Being prepared & with needed meds, food, water, etc

- Being prepared to follow an evacuation route no matter where we are in the valley
- Being separated from family & not knowing where they are & if they are safe
- Best means of transportation, assisting our neighbors, best route
- Best methods to safely and quickly get to high ground
- Can I make it with the children will I hear the warnings. Will the "official" system fail
- Cause of them, increased activity of mountain, global warning
- Community response & explaining evacuation routes
- Declining property values escape routes
- Difficulty it will be to get out on the roads and get to higher ground
- Direction of different lahars, mode of transportation, how to contact spouse at work
- Discuss getting a bridge for the safest best option for escape
- Discussion w/children about safety & preparedness, trade off for living in the shadow of Mt
- Escape for us & others
- Escape routes, meeting points, what to take with, means of transportation
- Escape, depth of mudflow, availability of food & water
- Evacuating-supplies-were to meet if we are separated
- Evacuating school children
- Evacuation
- Evacuation means & route
- Evacuation plan, making sure my children know what to do
- Evacuation planning
- Evacuation plans, routes, pick-up places, communication w/family
- Evacuation route & how to get out of Orting safety
- Evacuation route, how to access them, what to take along
- Evacuation routes
- Evacuation routes, distance to be safe and elevation to be safe.
- Evacuation routes. What to take with us in emergency bag
- Evacuation, the size, time and extent of damage
- Evacuations-warning system failures
- Every time I come through town (on my way to my NEW home) I admire that huge beautiful mountain & try to speculate how "mud" could make it over all those foothills, or if it could even reach town
- Every year my school Starmigan Ridge evacuates-does z practice drills-usually w/the sirens-we talk about improving our time to get everyone to high ground & adequate shoes /clothing for the walk
- Inevitability of it all, concerns about kids at school being doomed
- Family evacuation procedure & preparation
- Family preparedness, alternate routes, meeting points if separated
- Finding the nearest boat
- Gathering family if evacuation is during day. Kids in school, parents working in different parts of state
- Getting out in time
- Getting out of the valley. Where my children are or will be. Moving out of the area. Will I be in town when it happens?
- Getting out of this valley
- Getting prepared to take off quickly
- Happenings to other people
- Have we done everything possible to survive? What are our options and where is the best locations to evacuate too
- Having enough time to get to high ground and safety
- Helping others, evacuations
- Hope it doesn't reach us! Where will I meet my family if we are separated
- Hope it won't happen in my lifetime
- Hope we aren't home-how little chance the majority of people have to get out safety
- Hope we hear the warning
- Hot to get out, the effect where to stay, who to help
- How all the people will get out before it hits. It will be very scary for some
- How angry I am that our children are burdened with one more thing to worry about, that the lahar warning system keeps having false alarms & no one is going to believe it if it sounds for real
- How chaotic it will be with so many cars/people trying to escape to higher ground
- How deep it will be & how fast it is moving
- How devastating it will be. How to take care of ourselves without our belongings. Where will we live?

- How fast the mass of earth and water would move
- How fast the mud would flow
- How hard it is to hear warning too many people using same road
- How impossible it would be to actually get out if town due to heavy traffic congestion on a normal workweek (Monday to Friday)
- How many people will get out & why are they allowing more people to move into this area
- How much it gets put on the news and new things are put in the paper
- How my kids would get out of the valley from school
- How people & property will be affected
- How safe I am where I live and the options I have to get home if I'm working or shopping
- How screwed we would be
- How stupid local, county & state government is to continue to allow development to occur in danger zones without providing routes for escape
- How to get kids out. Where to go to get out. What people severely impacted will do
- How to get out and if I am safe when I live. Am I prepared
- How to get out and what to take with us
- How to get out of town, where we will meet if separated Emergency contact for each family member
- How to get students out to safety - not being home to take care of animals
- How to get to safe place. How to help others do the same
- How we'd never escape it anyway. Why people think Orting is the only community going to be hurt by a lahar
- How wild and crazy people would be acting. If you didn't get out how you would have a free burial
- I answer my sons questions to the best of my ability and sometimes my co-workers
- I have a relative who plans lahar escapes routes & we talk about them about once a month or so
- I hope it never happens. Buckley is built on top of a mud flow
- I lack within a community and we train twice a year for disasters including lahars
- I make sure there is gas in the car & that I know where important papers are, etc
- I spend 1/50 of my time in valley bottom, 1/500 yr chance, 1/50 not making it out, 1/1million chance, going out any day is more dangerous
- I talk about being glad I don't live in the valley
- I talk to my neighbors about all of the false alarms that have happened
- I talk to the lord about it & ask him to spare us
- I teach Earth Science so I explain how they work
- I tell people I live in Orting and they say the Mt is going to get me
- I tell people that I get to see the mountain every time I open the blinds - and that's the "trade-off"
- I think about evacuating and having enough time. I talk with friends who aren't from this area
- I took a few geology classes in college. I do not worry about a lahar because I understand the science aspect of them. I talk to others to tell them what I've learned
- I was in Morton when Mount St Helens erupted, so I know something of the danger
- I work at a High School next to a lahar warning system
- I work at a school. We have a drill once a year
- I work at city of Orting, WA so I inform the public of the evacuation routes
- I work for a group that focuses on emergency management
- I work with students, and many have concerns, so we discuss their options
- I worry about my daughter's evacuation from school and wonder when out foot bridge to safety will be put in place
- If & when ifs what is to happen we can't stop it. Only enjoy our day to day life
- If I can survive
- If my kids are at school, will they get out safely
- If there will be enough time to escape and if we do what the biological and economical scale of damage would be
- If we can take all the dogs with us and hopefully not too much traffic so we can get up to safer areas
- Is our neighborhood really far enough away to be safe
- Is there really enough time to get to a safe place?
- Joke
- Kids in Orting, surrounding communities
- Losing our house, false alarms, NOAA radio, Orting is in the news, safety of our family, real estate value if more in paper/news
- Loss of home & jobs & industry
- Meeting places, evacuation routes, what to take, what to leave, where to go

- My family, daily events, world events, the future
- My friends are concerned
- My parents recently moved to Auburn Valley so I talk with them to make sure they are aware of evacuation
- Need to get more prepared: i.e. walkie talkie, put everything to take in one place etc
- Now that my dog has died it will be easier to get up & go. I think about my family farm where I live under muck forever & never coming back to get things
- Our daughter is very worried about it so we discuss the possibilities
- Pessimism that any type of orderly evacuation is possible. Means of saving the children-support bridge for kids in Orting across Carbon Rivers
- Planning evacuation at school I- I am a teacher working on Bridge for kids - planning for bridge
- Possibility of a lahar - areas most likely affected
- Preparation
- Preparation and plan of action
- Preparation, assistance my neighbors may need
- Probability of a lahar. Chances of evacuation. Evacuation routes. Grid lock on out roads leading out of town
- Reassuring my children that we have a plan
- Remind my children to walk or run to the evacuation site
- Safety for our children. Putting together a preparedness kits
- Speed, scope, path, devastation
- Supplies - water
- Survival
- Talk about evacuation routes kids use at school, where we all would meet, concerns about home & other personal property being destroyed/damaged
- Tests not working as planned
- That I never hear them - I work in the next town-15 minutes away in the Puyallup Valley - I don't think they have lahar warning
- That I seldom hear the warning
- That it doesn't work here
- That its going to happen and nothings going to change it
- That there are to many bugs in the system
- The alarm tests and how the alarm cannot be heard at my house
- The best way to get kids out of day care
- The damage it makes, time you have to get out of town
- The dangers
- The fact that we can't hear the lahar siren when you are in the house - also worry about our kids
- The fact, that the system doesn't work right false alarms
- The inevitability of one happening. How deep will the mud be around my house
- The kind of damage it would cause. Does my insurance cover lahar damage?
- The lack of capacity on sr162 and on the new homes being built in the Puyallup Valley
- The news coverage about them & about our warning system
- The only time I've thought about them is when false alarms are reported in the news
- The probability of one happening
- The safety of my only son
- The time to evacuation (not) enough time
- There should be hiking trails up the hill to Puyallup as an alternative (California hills had "fire roads") routes to escape. Kids in the school could move faster on scooters
- They are scary that I need to move
- Think about what my response will be when there is a warning - how to evacuate
- This devastation of what could happened
- This valley has had lahars in the past. Could happen again
- Timing
- To be prepared. They can't guarantee that it will happen in my lifetime & I am not prepared to move
- Traffic congestion on Orting highway
- Training & supplies
- We are high enough to avoid the river but possibly in the pass for dust & fumes
- We have natural hazards every where and if it happens -it happens
- We live in a gated community where we have had pc net training. We discuss personal & community evacuation issues
- We need better escape routes for the students

- We talk about how inadequate the alarms were during the drill
- We talk about how to evacuate, how effective the evacuation will be, and what will happen to our house/neighborhood
- We think about the city's (Orting) plan & the unlikeliness that everyone will be able to get out in time due to added housing/population increase
- We wonder about the wisdom of all the new developments in Orting if they really think Mt Rainer is likely to blow
- Went to visit St Helens & it was amazing
- What a mess evacuation is going to be and how crazy people are going to get. How unprepared the towns around here are. The evacuation route signs have been up for so long. I doubt anyone could tell you where they are
- What damage might occur to my home. How to evacuate. What supplies we should have
- What I'll would do in case
- What I would do to escape, what needs to be done to improve escape possibilities
- What I would do, how I would communicate with family
- What it would look like, how devastating it would be for the Orting Valley
- What supplies we have
- What survival will be like
- What to take with you
- What we do after an event
- What will happen to our home
- What will I do
- What would happen. How big would the lahar be. Could we get out of here
- When it will happen
- When it will happen, what time for day or night and what route we well take
- When the siren does go off (in scheduled practice runs) I'm unable to hear it at work and the siren is across the street so I talk about the bugs needing to be worked out of the system
- When/what we will do
- Where people will go, how we will be impacted by displaced families, services available, food & water
- Where the family should meet if some are in the valley and some are not
- Where to go if we should occur
- Where to go, which way to head & traffic jams that will occur
- Where will go. Where are kids will be
- Where will my children end up? Do we have enough supplies? What about other folks?
- Whether it might happen
- Whether or not we would make it out of the valley. If we'd have to abandon the car and go on foot. If my neighbors would need help
- Which car to take & which child/dog to take with me
- Which part of mountain will collapse
- Who's job it is to grab what. Priorities on loading things in car. Time we have to do this before we need to leave
- Why does the sign outside S.Prairie now say tsunami evacuation route? "I hope we are at home together when it goes so we can take care of our animals stranded on the hill"
- Why worry - if it's your time to go its your time to go
- Will it happen
- Will my wife be able to travel the necessary distance in the allotted time? What should be included in our back pack? Where will we meet if separated?
- Will we have time to get out alive? Will the horns/warning systems actually work? Will my family be able to meet up fairly easily?
 You can't run from mother nature, we have a plan if it doesn't work we are dead



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