



BIBLIOGRAPHIC REFERENCE

Johnston, D.; Becker, J.; Coomer, M.; Ronan, K.; Davis, M.; and Gregg, C. 2006. Children's risk perceptions and preparedness: Mt Rainier 2006 hazard education assessment tabulated results, *GNS Science Report* 2006/16 30p.

D. Johnston, GNS Science, PO Box 30368, Lower Hutt

J. Becker, GNS Science, PO Box 30368, Lower Hutt

M. Coomer, GNS Science, PO Box 30368, Lower Hutt

K. Ronan, Central Queensland University, Rockhampton, Queensland

C. Gregg, University of Hawaii, Manoa, Hawaii

M. Davis, Dominican University of California, San Rafael, California

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ABSTRACT

In 2006 a survey to assess students' understanding of and response to lahar hazards was undertaken in two schools – Orting Middle School and Sumner High School - 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, students, children, Orting Middle School, Sumner High School, Mt. Rainier, Washington.

1.0 INTRODUCTION

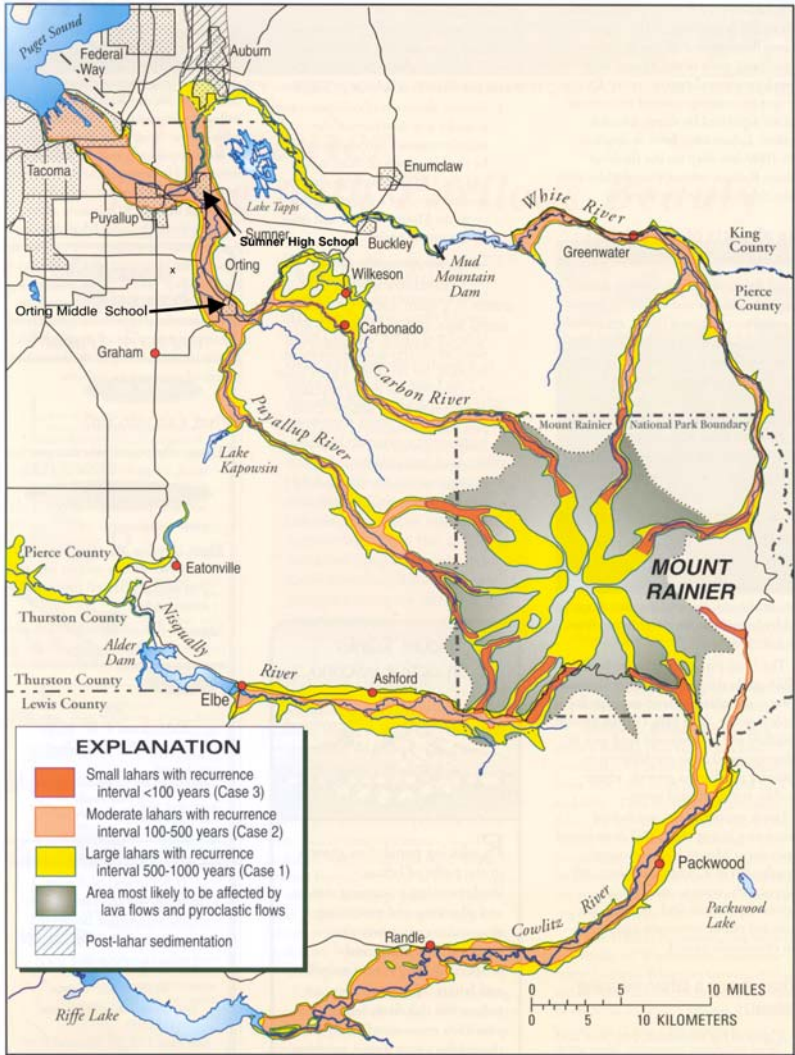
Mt. Rainier is a large, active volcano in Washington State, United States. While a variety of volcanic hazards at Mt Rainier threaten the region, there is more summit snow and ice cover on Mt. Rainier than all other Cascade volcanoes combined, exacerbating the lahar hazard. During the past few thousand 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 smaller 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 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).

Local school educators and their students can play a crucial role in disseminating information about natural processes, hazards, and recommended preparedness measures. To assist with this process, educators in the local area around Mt Rainier have incorporated geological and hazard issues into their classrooms to varying extents (Johnston et al., 2001a).

The effectiveness of such school education programmes can be addressed through the use of social science research. Research on hazard understanding and preparedness (with an emphasis on volcanic hazards), was initially conducted in 2000 with Orting High School and three other local schools (Johnston et al., 2001b). In 2005, a second survey was conducted in two schools located in lahar zones around Mt. Rainier (Orting High School and Orting Middle School), to evaluate current understanding of local hazards and preparedness (Johnston et al. 2005). This report presents tabulated results from the most recent survey in 2006 and includes a brief discussion of the key findings.

Figure 1. Location map of Mount Rainier, Sumner High School and Orting Middle School (Map courtesy of USGS).



2.0 SURVEY INSTRUMENT

The survey used in 2006 was based on one developed for the Mount Rainier study in 2000 (Johnston et al., 2001b) and in 2005 (Johnston et al. 2005). It is designed to assess students' level of awareness, risk perceptions, factual knowledge, physical preparedness and psychological issues related to hazards and mass emergencies (i.e., floods, storms with high winds (such as tornadoes or cyclones), fires, earthquakes, volcanic eruptions, tsunami and chemical spills/gas leaks). It also assessed students' prior exposure to specific hazards and to educational programmes designed to increase awareness, knowledge, and preparedness that were provided either by emergency management or school staff (primarily teachers).

Some of the main themes covered by the questionnaire include:

1. **Risk perceptions.** Students were asked a series of questions that addressed perceptions concerning a range of hazards: (a) the two most likely hazards to affect them at home; (b) the two most likely hazards to affect them at school; (c) the likelihood of occurrence of each hazard; and (d) the students' physical risk in the event of each hazard occurring.
2. **Psychological issues.** Students were asked about (a) becoming scared or upset when discussing hazards, and, if so, (b) which specific hazards were upsetting to think about or discuss; (c) their perception of any parental upset when discussing hazards; and (d) their perception of emotional and behavioural coping ability in the event of a hazard.
3. **Home- and school-based hazard communication.** Students were asked whether they had talked about any of the specific hazards with parents or teachers. If they discussed them with parents or teachers, they were then asked to indicate who initiated the discussion.
4. **Previous exposure to hazards.** Students were asked whether or not they had directly experienced any of the specific hazards.
5. **Preparedness: factual knowledge.** Students were asked to endorse the item or items they felt were appropriate responses in the event of exposure to specific hazards. Students were reminded that more than one item could be endorsed if it represented the appropriate response to that hazard.
6. **Preparedness: performance-based and physical preparedness.** Students were asked a series of questions related to actual preparedness concerning

whether or not the following were in place at their home: (a) family emergency plan, (b) map of the house showing exits, utility switches, etc., (c) participating in role play or practice about what to do in the event of an emergency, (d) procedure for contacting a family member in the event of an emergency, (e) procedure for being collected from school in the event of an emergency and (f) availability of a flashlight, battery powered radio, and spare batteries in a known place.

7. **Social support.** Students were asked to indicate who they felt to be helpful in assisting them to be prepared for an emergency (i.e. parents, teachers, Civil Defence, friends, others).
8. **Specific volcanic hazards.** Students were asked several questions about the risk from volcanoes such as which volcano they thought might erupt next, and what the greatest volcanic hazard was.

3.0 PROCEDURE

Under the supervision of the local emergency management staff, a teacher from each school administered the survey to students within each class. The purpose of the survey was explained to the students. It was also explained to the students that there are no right or wrong answers, and that their answers were to reflect their current understanding. Students were encouraged to ask questions if they did not understand a particular item. The total time necessary to administer each survey was approximately 25-35 minutes. After the assessments were collected, the appropriate responses (where the appropriate response(s) existed) to each item were given to the students.

A total of 165 students from Orting Middle School and 191 students from Sumner High School answered the questionnaire.

4.0 RESULTS

Results of the 2006 survey are shown below in tabular format for each question asked in the survey.

Question 1. Which are the two most likely hazards that could affect you at home?

	Orting Middle School (n=165)	Sumner High School (n=185)
Flood	25.5	9.2
Storm with high winds	21.3	41.7
Fire	38.5	39.7
Earthquake	35.3	46.4
Volcanic mudflow (lahar)	46.3	35.0
Tsunami	0.6	0.5
Chemical spill or gas leak	5.1	7.6
Volcanic ash fall	13.3	8.7
Landslides	14.0	11.0

Question 2. Which are the two most likely hazards to affect you at school?

	Orting Middle School (n=165)	Sumner High School (n=185)
Flood	24.4	5.9
Storm with high winds	9.1	11.3
Fire	22.2	22.7
Earthquake	38.2	58.4
Volcanic mudflow (lahar)	74.5	60.5
Tsunami	1.2	0.5
Chemical spill or gas leak	3.9	5.4
Volcanic ash fall	4.5	7.0
Landslides	4.5	3.2
School violence	17.4	25.4

Question 3. When do you think the next hazard events are likely to affect your community?

Orting Middle School	Within the next year %	Within the next 10 years %	Within your lifetime %	Not within your lifetime %
Flood (n=164)	29.6	27.2	31.5	11.7
Storm with high winds (n=164)	45.1	24.7	20.4	9.9
Fire (house fire) (n=164)	20.9	15.5	44.2	19.6
Earthquake (n=164)	22.7	41.1	34.4	1.8
Volcanic mudflow (lahar) (n=164)	7.5	30.4	42.9	19.3
Tsunami (n=164)	3.1	6.9	16.4	73.6
Chemical spill or gas leak (n=164)	9.5	24.7	32.9	32.9
Volcanic ash fall (n=164)	6.4	23.1	44.9	25.6
Landslides (n=164)	15.2	30.4	35.4	19.0
Violent incidents in school (n=164)	33.5	29.7	27.7	9.0

Sumner High School	Within the next year %	Within the next 10 years %	Within your lifetime %	Not within your lifetime %
Flood (n=191)	11.6	25.4	37.6	25.4
Storm with high winds (n=191)	67.2	16.9	13.2	2.6
Fire (house fire) (n=191)	24.2	13.7	43.7	18.4
Earthquake (n=191)	22.8	56.1	18.5	2.6
Volcanic mudflow (lahar) (n=191)	4.9	22.8	48.9	23.4
Tsunami (n=191)	1.6	2.7	18.6	77.1
Chemical spill/gas leak(n=191)	5.9	20.5	44.3	29.2
Volcanic ash fall (n=191)	3.8	17.9	55.4	22.8
Landslides (n=191)	10.9	27.2	44.0	17.9
Violent incidents in school (n=191)	38.0	25.5	21.7	14.7

Question 4. Should one of these events occur in the future how likely is it that it could hurt you or your family?

Orting Middle School	Likely %	A chance %	Unlikely %
Flood (161)	18.6	43.5	37.9
Storm with high winds (161)	34.8	44.7	20.5
Fire (house fire) (161)	32.5	53.8	13.8
Earthquake (161)	39.9	52.5	7.6
Volcanic mudflow (lahar) (161)	40.4	34.2	25.5
Tsunami (161)	8.1	11.2	80.7
Chemical spill/gas leak (161)	11.9	47.2	41.0
Volcanic ash fall (161)	26.1	50.3	23.6
Landslides (161)	23.1	50.0	26.9
Violence in school (161)	28.0	52.8	19.3

Sumner High School	Likely %	A chance %	Unlikely %
Flood (187)	14.0	34.4	51.6
Storm with high winds (187)	41.9	46.2	11.8
Fire (house fire) (187)	33.9	51.1	15.1
Earthquake (187)	35.3	57.2	7.5
Volcanic mudflow (lahar) (187)	33.9	37.6	28.5
Tsunami (187)	8.6	12.3	79.1
Chemical spill/gas leak (187)	13.5	43.2	43.2
Volcanic ash fall (187)	18.7	55.6	25.7
Landslides (187)	18.7	43.9	37.4
Violence in school (187)	29.6	44.6	25.8

Question 5. Does thinking or talking about any of these hazards scare or upset you?

	Orting Middle % (n=162)	Sumner High % (n=187)
Not at all	64.2	60.4
Sometimes	31.5	35.8
Often	4.3	3.7

Question 6. If yes, which ones? (circle all that apply)

	Orting Middle % (n=278)	Sumner High % (n=336)
Flood	17.0	7.9
Storm with high winds	9.7	15.2
Fire	23.6	25.1
Earthquake	14.5	22.0
Lahar	35.8	29.8
Tsunami	12.1	12.0
Chemical spill or gas leak	8.5	12.6
Volcanic ash fall	16.4	19.9
Landslides	12.7	12.0
Violence in school	18.2	19.4

Question 7. Does talking about these hazards upset your parents?

	Orting Middle % (n=153)	Sumner High % (n=183)
Yes	7.2	4.4
Not sure	54.9	54.6
No	37.9	41.0

Question 8. If an emergency happened, some kids and adults get upset. If you were to get upset, do you feel you would be able to help you feel less upset?

	Orting Middle % (n=165)	Sumner High % (n=191)
Mean	5.0	6.0
S.D.	2.0	1.0

Scale 1 2 3 4 5 6 7
 Not at all Somewhat able Completely able

Question 9. Have you ever discussed any of the following with your parents?

Yes	Orting Middle %
Flood (n=69)	44.2
Storm with high winds (n=46)	29.9
Fire (house fire) (n=109)	69.4
Earthquake (n=115)	73.2
Volcanic mudflow (lahar) (n=122)	74.8
Large sea wave (tsunami) (n=34)	22.4
Chemical spill or gas leak (n=31)	20.1
Volcanic ash fall (n=72)	46.5
Landslides (n=54)	34.8
Violence in school (n=86)	55.1

Yes	Sumner High %
Flood (n=80)	44.0
Storm with high winds (n=119)	64.7
Fire (house fire) (n=145)	76.7
Earthquake (n=131)	70.1
Volcanic mudflow (lahar) (n=116)	63.0
Large sea wave (tsunami) (n=45)	24.9
Chemical spill or gas leak (n=44)	24.3
Volcanic ash fall (n=80)	43.7
Landslides (n=77)	42.3
Violence in school (n=103)	56.6

Question 10a. If you talked about any of these hazards, did you bring it up or did your parent(s)?

	Orting Middle Sc % (n=26)	Sumner High % (n=23)
I did	16.9	13.9

	Orting Middle % (n=39)	Sumner High % (n=29)
Parents	25.3	17.6

	Orting Middle % (n=89)	Sumner High % (n=113)
Both	57.8	68.5

Question 10b. If you talked about any of these hazards, did you discuss how to prepare at home?

	Orting Middle % (n=165)	Sumner High % (n=191)
Yes	65.7	63.4
No	34.3	36.6

Question 11. Have you ever had a classroom discussion on any of the following?

Yes	Orting Middle %
Flood (n=153)	50.3
Storm with high winds (n=149)	37.6
Fire (house fire) (n=156)	26.9
Earthquake (n=158)	93.7
Volcanic mudflow (lahar) (n=161)	90.7
Large sea wave (tsunami) (n=152)	50.7
Chemical spill or gas leak (n=153)	60.8
Volcanic ash fall (n=153)	56.9
Landslides (n=154)	53.9
Violence in school (n=155)	80.6

Yes	Sumner High %
Flood (n=178)	45.5
Storm with high winds (n=180)	46.1
Fire (house fire) (n=188)	80.3
Earthquake (n=189)	92.1
Volcanic mudflow (lahar) (n=189)	88.4
Large sea wave (tsunami) (n=177)	36.2
Chemical spill or gas leak (n=179)	41.3
Volcanic ash fall (n=179)	53.1
Landslides (n=178)	46.6
Violence in school (n=187)	87.2

Question 12a. If discussed, who brought it up?

	Orting Middle % (n=158)	Sumner High % (n=189)
I did	0.6	1.1
Teacher	85.4	79.8
I did and so did my teacher	14.0	19.1

Question 12b. If you talked about any of the hazards above, did you discuss how to prepare for hazards at home?

	Orting Middle % (n=154)	Sumner High % (n=182)
Yes	60.1	63.7
No	39.9	36.3

Question 13. Have you ever had your neighbourhood flooded?

	Orting Middle % (n=158)	Sumner High % (n=188)
Yes	27.8	14.9
No	72.2	85.1

Question 14. Which of the following things would you do during a flood? (circle all that apply)

	Orting Middle % (n=161)	Sumner High % (n=189)
Go outside and look at the rising water	35.9	64.1
Stay inside and wait to be told what to do	53.6	46.4
Listen to the radio	35.6	64.4
Move to area higher than flood level	46.0	54.0

Question 15. Have you ever seen an actual volcano erupt?

	Orting Middle % (n=141)	Sumner High % (n=162)
Yes	72.3	80.9

If yes:

	Orting Middle % (n=102)	Sumner High % (n=131)
TV	82.9	92.6

	Orting Middle % (n=102)	Sumner High % (n=131)
Live	4.9	8.0

Question 16. Does Washington State have any volcanoes capable of erupting?

	Orting Middle % (n=159)	Sumner High % (n=187)
Yes	95.0	97.9

Question 17. Which of the following things would you do during a volcanic eruption?
(circle all that apply)

	Orting Middle % (n=162)	Sumner High % (n=189)
Go outside and look at the eruption	17.9	28.6
Listen to the radio	30.9	50.3
Close all the windows and doors	33.9	40.7
Open all windows and doors	4.8	3.7
If building is in immediate danger, evacuate at once	83.3	82.5
If building is not in immediate danger, stay inside	38.3	40.2

Question 18. Has a fire ever damaged your home?

	Orting Middle % (n=163)	Sumner High % (n=190)
Yes	12.9	11.1

Question 19. Have you ever seen a house or building on fire?

	Orting Middle % (n=144)	Sumner High % (n=172)
Yes	95.1	95.3

If yes:

	Orting Middle % (n=71)	Sumner High % (n=105)
On TV	49.3	61.0

	Orting Middle % (n=101)	Sumner High % (n=107)
Live	70.1	62.2

Question 20. Which of the following would you do during a fire? (circle all that apply)

	Orting Middle % (n=160)	Sumner High % (n=185)
Leave the house by the shortest route	93.1	91.9
Stay inside and wait to be told what to do	5.6	5.4
Close any doors that you pass through	15.6	23.2
Open all doors and windows	17.5	17.3

Question 21. Have you ever felt an earthquake?

	Orting Middle % (n=163)	Sumner High % (n=190)
Yes	93.9	97.4

Question 22. Which of the following would you do during an earthquake? (circle all that apply)

	Orting Middle % (n=161)	Sumner High % (n=186)
Run outside	17.4	11.3
Stay inside and take cover	70.2	66.7
Drop, cover, hold	59.0	67.2
Stay right where you are and wait for it to be over	11.2	15.1

Question 23. Have you ever been in a storm with high winds?

	Orting Middle % (n=159)	Sumner High % (n=190)
Yes	61.6	90.5

Question 24. Which of the following would you do in a storm with high winds? (circle all that apply)

	Orting Middle % (n=155)	Sumner High % (n=180)
Do nothing, just wait for it to be over	31.6	36.1
Run outside and take cover	3.9	4.4
Stay inside away from windows	79.4	73.9
Open window on side of house away from the wind (sheltered side)	10.9	8.9
Open window on side of house closest to wind (unsheltered side)	6.5	2.8
Close all windows	54.8	55.6

Question 25. Have you ever been in an area that has had a chemical spill?

	Orting Middle % (n=161)	Sumner High % (n=188)
Yes	11.8	7.4

Question 26. Which would you do if a chemical spill happened in your area? (circle all that apply)

	Orting Middle % (n=158)	Sumner High % (n=185)
Tune to local radio or TV station and follow instructions	64.6	79.5
Run outside and take cover	13.3	10.3
Shelter in place	55.1	37.3

Question 27. What would you do if a tsunami was coming? (circle all that apply)

	Orting Middle % (n=160)	Sumner High % (n=187)
Stay inside	6.3	6.4
Run outside and take cover	5.6	2.7
Go at least 1/2 mile inland or 100 feet above sea level	92.5	89.3
Watch for the sea wave to come	8.8	13.4

Question 28. Have you ever been involved in an education program that informed you about hazards and what to do if an emergency happens?

	Orting Middle % (n=161)	Sumner High % (n=186)
Yes	52.8	74.7

Question 29. If yes, where?

	Orting Middle % (n=86)	Sumner High % (n=141)
School	90.7	90.1
Outside school	26.7	24.8

Question 30. Who taught the program:

	Orting Middle % (n=91)	Sumner High % (n=142)
Teacher	81.3	83.1
Emergency Management	23.1	28.9
Fire	32.9	49.3
Law Enforcement	25.3	41.5
Other	17.6	16.9

Question 31. Has your school ever encouraged you to talk with your parents about emergencies / hazards?

	Orting Middle % (n=164)	Sumner High % (n=188)
Yes	81.7	83.5

Question 32. Have you ever gone home and told your parents about what you learned about natural hazards?

	Orting Middle % (n=161)	Sumner High % (n=186)
Yes	61.5	54.8

Question 33. If so, were your parents willing to discuss how to be prepared?

	Orting Middle % (n=140)	Sumner High % (n=155)
Yes	72.8	75.5

Question 34. Does your family have an emergency plan that tells you how to act during an emergency?

	Orting Middle % (n=159)	Sumner High % (n=184)
Yes	35.8	33.2
Not sure	45.9	42.9
No	18.3	23.9

Question 35. Have you ever practised what to do in an emergency at school?

	Orting Middle % (n=161)	Sumner High % (n=188)
Yes	86.9	87.2

Question 36. Does your family have a plan of your house showing exits, and where to turn off water, electricity, gas?

	Orting Middle % (n=161)	Sumner High % (n=186)
Yes	18.6	26.9
Not sure	45.3	34.4
No	36.1	38.7

Question 37. In an emergency, family members may be widely dispersed – some at home, some at work and some at school. Do you have a place to meet at a safe location?

	Orting Middle % (n=159)	Sumner High % (n=184)
Yes	23.3	20.1
Not sure	45.3	45.1
No	31.4	34.8

Question 38. In an emergency, do you have a plan for how to contact your parents?

	Orting Middle % (n=162)	Sumner High % (n=187)
Yes	60.5	60.9
Not sure	22.2	21.5
No	17.3	17.6

Question 39. Has your family done any of the following to prepare for a hazard or emergency? (circle the appropriate responses)

Answered 'yes'	Orting Middle % (n=156)	Sumner High % (n=187)
Have a working flashlight	81.4	79.7
Re-arranged breakable household items	19.2	20.9
Put strong latches on cabinet doors	17.3	20.3
Stored hazardous materials safely	46.2	48.1
Added lips to shelves to keep things from sliding off	20.5	18.2
Strapped water heater	27.6	36.4
Installed flexible piping to gas appliances	20.5	23.5
Braced house walls	20.5	24.6
Bolted house to foundation	30.1	36.9
Arranged bracing for pile foundation	16.0	17.6
Stockpiled water and food for three days	37.8	39.0
Have a transistor radio and spare batteries	43.6	41.2
Have a fire extinguisher	60.9	71.1
Have a smoke detector	91.0	90.4
Have a first aid kit	82.1	77.0
Stored emergency equipment (e.g. flashlight, fire extinguisher)	52.6	58.3
Put spanner or wrench by gas turn-off valve	19.9	23.5
Picked an emergency contact person outside your area	48.7	48.1
Someone in family has learned how to put out fires	48.7	66.3
Bought additional insurance (e.g., home)	51.9	49.7
Someone in family has learned to provide first aid	66.7	66.8
Found out if you are in an area particularly vulnerable to a natural or other kind of hazard (e.g., earthquake, flood, chemical spill)	45.5	48.1
Had your home inspected for earthquake resistance	16.7	21.4
Have a family emergency plan	46.8	37.4
Have a house plan showing exits, assembly areas, where to turn off water, electricity, gas	23.1	21.9
Know who is responsible for collecting children from school	49.4	35.3
Know where child would meet family or where to leave a	42.9	40.1

message if everyone can't be at home		
Looked for information on preparing for emergencies	29.5	31.6

Question 40. Which volcano do scientists consider most likely to erupt next?

	Orting Middle % (n=157)	Sumner High % (n=183)
Mount St. Helens	55.4	34.4
Mount Baker	2.5	2.7
Mount Rainier	48.4	67.9
Mount Adams	1.9	3.2

Question 41. Which volcano hazard places your home at greatest direct risk?

	Orting Middle % (n=156)	Sumner High % (n=176)
Volcanic ash	39.7	52.8
Volcanic gases	7.7	9.7
Volcanic mudflows	62.8	50.0
Lava flows	12.2	10.8

Question 42. Which volcano hazard places your school at greatest direct risk?

	Orting Middle % (n=158)	Sumner High % (n=184)
Volcanic ash	16.5	17.9
Volcanic gases	8.2	9.2
Volcanic mudflows	87.9	85.9
Lava flows	17.7	19.0

Question 43. Earthquakes in the Puget Sound lowlands cause volcanic eruptions

	Orting Middle % (n=157)	Sumner High % (n=184)
Yes (true)	15.3	21.2
Not sure	71.3	68.5
No (false)	13.4	10.3

Question 44. Where would you prefer to seek and get information about future volcanic activity in Washington State? (please circle only one, your most preferred)

	Orting Middle % (n=)	Sumner High % (n=180)
TV and radio	43.9	49.4
Your local library	12.1	8.9
Internet	40.1	35.0
School	20.4	31.1
Emergency responders (police, fire, etc.)	21.0	22.2
Other	7.0	7.8

Question 45. For these final questions, please put the number that corresponds with your response. Choose a number from the scale below that shows how much you agree or disagree with each of the following statements.

Orting Middle School	Agree ← (scale) → Disagree				
	strongly				strongly
	1	2	3	4	5
Preparing for volcanic activity can protect myself and my family % (N=154) (Mean=2; s.d=1)	54.5	19.5	18.8	2.6	4.5
Preparing for volcanic activity can reduce damage to our home % (N=154)(Mean=3; s.d=1)	21.4	15.6	27.2	15.6	26.6
I am motivated to prepare for future volcanic activity or other hazards % (N=154)(Mean=3; s.d=1)	20.1	26.6	28.6	14.3	10.4
My family is motivated to prepare for future volcanic activity or other hazards % (N=154) (Mean=3; s.d=1)	21.4	21.4	36.4	12.3	1.9
Preparing for volcanic activity or other future hazard is a responsibility of our whole community % (N=154)(Mean=2; s.d=1)	33.7	32.5	20.8	7.1	5.8

Sumner High School	Agree ← (scale) → Disagree				
	strongly				strongly
	1	2	3	4	5
Preparing for volcanic activity can protect myself and my family % (N=178) (Mean=2; s.d=1)	50.6	23.0	16.3	6.2	3.9
Preparing for volcanic activity can reduce damage to our home % (N=177)(Mean=3; s.d=1)	24.2	13.5	23.6	15.1	23.0
I am motivated to prepare for future volcanic activity or other hazards % (N=178)(Mean=3; s.d=1)	22.5	23.0	30.3	15.2	8.9
My family is motivated to prepare for future volcanic activity or other hazards % (N=177) (Mean=3; s.d=1)	20.8	23.0	33.1	13.5	8.9
Preparing for volcanic activity or other future hazard is a responsibility of our whole community % (N=177)(Mean=2; s.d=1)	32.0	26.9	26.9	7.3	6.2

Question 46. Choose a number from the scale below that shows how much you agree or disagree with each of the following statement. “The ultimate responsibility to protect us from volcanic and other hazards rests with which groups”.

Orting Middle School	Agree strongly ← (scale) → Disagree strongly				
	1	2	3	4	5
Federal Government % (N=152) (Mean=3; s.d=1)	17.8	23.7	34.2	15.1	9.2
State Government % (N=150) (Mean=3; s.d=1)	23.7	26.3	29.6	9.8	13.8
Local Government % (N=153) (Mean=2; s.d=1)	26.9	33.6	19.7	11.2	4.6
My school % (N=153) (Mean=2; s.d=1)	29.6	23.7	25.7	12.5	9.2
Myself and my family % (N=151) (Mean=2; s.d=1)	46.7	18.4	22.4	7.9	3.9

Sumner High School	Agree strongly ← (scale) → Disagree strongly				
	1	2	3	4	5
Federal Government % (N=173) (Mean=3; s.d=1)	33.5	13.3	25.4	10.4	17.3
State Government % (N=173) (Mean=2; s.d=1)	41.0	23.1	15.0	8.7	12.1
Local Government % (N=173) (Mean=2; s.d=1)	39.9	26.0	17.3	6.0	9.8
My school % (N=173) (Mean=2; s.d=1)	31.8	22.5	26.0	7.5	12.1
Myself and my family % (N=173) (Mean=2; s.d=1)	49.7	18.5	18.5	4.0	9.2

5.0 KEY FINDINGS

This report presents a preliminary summary of the results from the February 2006 survey. Key findings that relate to the lahar risk are:

- A high proportion of Orting Middle School students (75%) and Sumner High School students (61%) perceive lahar as one of the most likely hazards to affect their school. For Orting Middle School these results are similar to previous studies (2000 and 2005), but show a significant change in perceived lahar hazard likelihood for Sumner (increased from 26% in the year 2000 to 61% in 2005).
- However, in the 2006 survey, 80% of children from Orting Middle school and 76% of children from Sumner High School thought that lahars could affect their community within their lifetime. Of the students from Orting Middle School, 38% believed that this could occur within a ten year timeframe compared to 28% from Sumner High School.
- The majority of children from both schools perceive possible consequences from a lahar to be severe, with only a quarter not expecting to suffer harm personally from lahars.
- Both schools reported similar levels of being sometimes or often scared or upset by hazards (just over 35%). Few students (less than 8%) from either school reported talking about hazards as upsetting to their parents.
- A high percentage of students from both Orting and Sumner schools (82% and 84% respectively) report being encouraged to discuss hazards at home by their teachers. Three quarters (75%) of Orting Middle School students report having discussed lahars in the home with their parents compared to 63% of students from Sumner High School. The Sumner High School result shows an improvement from the less than 50% result recorded in the 2000 survey.
- The vast majority of students from both schools report having classroom discussions about lahar hazards (91% in Orting Middle School and 88% in Sumner High School).
- When asked whether families had emergency plans, only 36% of Orting students and 33% of Sumner students reported this to be the case, with a further 46% in Orting Middle School and 43% of Sumner School being unsure.

- In summary, students have a good awareness of the lahar risk and perceive it to be a possible occurrence within their life time. Most students report being involved in education programs and there is evidence that they have interacted with their parents on hazard issues. Many of the results from 2006 appear to be consistent with the findings of earlier school assessments on lahar risk, especially with respect to Orting School. However, there has been a significant increase in lahar awareness and home based engagement over the past six years for students from Sumner.

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.
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APPENDIX 1

QUESTIONNAIRE

Hazards Education Assessment

School ID Number _____

School : _____

Gender : _____ Male _____ Female Age : _____

Which best describes your racial/ethnic identification?:

- _____ White
_____ African-American
_____ Native American/Eskimo/Aleutian Islander
_____ Asian
_____ Pacific Islander
_____ Hispanic (of any race or nationality)
_____ Other (please specify) _____

1. Which are the **two** most likely hazards that could affect you at home?

1. Flood
2. Storm with high winds
3. Fire
4. Earthquake
5. Volcanic mudflow (lahar)
6. Tsunami
7. Chemical spill or gas leak
8. Volcanic ash fall
9. Landslides

2. Which are the **two** most likely hazards to affect you at school?

1. Flood
2. Storm with high winds
3. Fire
4. Earthquake
5. Volcanic mudflow (lahar)
6. Tsunami
7. Chemical spill or gas leak
8. Volcanic ash fall
9. Landslides
10. Violent incidents in school

3. When do you think the next hazard events are likely to affect your community?

Flood

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Fire (house fire)

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Storm with high winds

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Earthquake

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Volcanic mudflow (lahar)

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Chemical spill or gas leak

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Landslides

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Tsunami

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Volcanic ash fall

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

Violent incidents in school

- 1 within the next year
- 2 within the next 10 years
- 3 within your lifetime
- 4 not within your lifetime

4. Should one of these events occur in the future how likely is it that it could hurt you or your family?

Flood

- 1 Likely
- 2 A chance
- 3 Unlikely

Fire (house fire)

- 1 Likely
- 2 A chance
- 3 Unlikely

Volcanic mudflow (lahar)

- 1 Likely
- 2 A chance
- 3 Unlikely

Chemical spill or gas leak

- 1 Likely
- 2 A chance
- 3 Unlikely

Landslides

- 1 Likely
- 2 A chance
- 3 Unlikely

Storm with high winds

- 1 Likely
- 2 A chance
- 3 Unlikely

Earthquake

- 1 Likely
- 2 A chance
- 3 Unlikely

Tsunami

- 1 Likely
- 2 A chance
- 3 Unlikely

Volcanic ash fall

- 1 Likely
- 2 A chance
- 3 Unlikely

Violent incidents in school

- 1 Likely
- 2 A chance
- 3 Unlikely

5. Does thinking or talking about any of these hazards scare or upset you? Not at all Sometimes Often
6. If yes, which ones? (Circle all that apply)
1. Flood
 2. Storm with high winds
 3. Fire
 4. Earthquake
 5. Volcanic mudflow (lahar)
 6. Tsunami
 7. Chemical spill or gas leak
 8. Volcanic ash fall
 9. Landslides
 10. Violent incidents in school
7. Does talking about these hazards upset your parents? No Not sure Yes
8. If an emergency happened, some kids and adults get upset. If you got upset, do you feel you would be able to help yourself feel less upset?
- | | | | | | | |
|-------------------|---|---|-----------------|---|---|-------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Not at all | | | Somewhat | | | Completely |
| | | | able | | | able |
9. Have you ever discussed any of the following with your parents?
- | | | |
|---------------------------------|-----|----|
| 1. Flood | Yes | No |
| 2. Storm with high winds | Yes | No |
| 3. Fire (house fire) | Yes | No |
| 4. Earthquake | Yes | No |
| 5. Volcanic mudflow (lahar) | Yes | No |
| 6. Tsunami | Yes | No |
| 7. Chemical spill or gas leak | Yes | No |
| 8. Volcanic ash fall | Yes | No |
| 9. Landslides | Yes | No |
| 10. Violent incidents in school | Yes | No |
- 10a. If you talked about any of these hazards, did you bring it up or did your parent(s)?
- _____ I did _____ Parents _____ I did and so did my parents
- 10b. If you talked about any of these hazards, did you discuss how to prepare at home? Yes No
11. Have you ever had a classroom discussion on any of the following?
- | | | |
|---------------------------------|-----|----|
| 1. Flood | Yes | No |
| 2. Storm with high winds | Yes | No |
| 3. Fire (house fire) | Yes | No |
| 4. Earthquake | Yes | No |
| 5. Volcanic mudflow (lahar) | Yes | No |
| 6. Tsunami | Yes | No |
| 7. Chemical spill or gas leak | Yes | No |
| 8. Volcanic ash fall | Yes | No |
| 9. Landslides | Yes | No |
| 10. Violent incidents in school | Yes | No |
12. If discussed, who brought it up? _____ I did _____ Teacher _____ I did and so did my teacher
- 12a. If you talked about any of the hazards above, did you discuss how to prepare for hazards at home? Yes No
13. Have you ever had your neighborhood flooded? Yes No

- 14.** Which of the following things would you do during a flood? Circle all that apply.
- 1 Go outside and look at the rising water
 - 2 Stay inside and wait to be told what to do
 - 3 Listen to the radio
 - 4 Move to area higher than flood level
- 15.** Have you ever seen an actual volcano erupt? Yes No
- If yes : On TV Live
- 16.** Does the Washington State have any volcanoes capable of erupting? Yes No
- 17.** Which of the following things would you do during a volcanic eruption? Circle all that apply.
- 1 Go outside and look at the eruption
 - 2 Listen to the radio
 - 3 Close all the windows and doors
 - 4 Open all windows and doors
 - 5 If building is in immediate danger, evacuate at once
 - 6 If building is not in immediate danger, stay inside.
- 18.** Has a fire ever damaged your home? Yes No
- 19.** Have you ever seen a house or building on fire? Yes No
- If yes : On TV Live
- 20.** Which of the following would you do during a fire? Circle all that apply.
- 1 Leave the house by the shortest route
 - 2 Stay inside and wait to be told what to do
 - 3 Close any doors that you pass through
 - 4 Open all doors and windows
- 21.** Have you ever felt an earthquake? Yes No
- 22.** Which of the following would you do during an earthquake? Circle all that apply.
- 1 Run outside
 - 2 Stay inside and take cover
 - 3 Drop, cover, hold
 - 4 Stay right where you are and wait for it to be over
- 23.** Have you ever been in a storm with high winds? Yes No
- 24.** Which of the following would you do in a storm with high winds? Circle all that apply.
- 1 Do nothing, just wait for it to be over
 - 2 Run outside and take cover
 - 3 Stay inside away from windows
 - 4 Open window on side of house away from the wind (sheltered side)
 - 5 Open window on side of house closest to wind (unsheltered side)
 - 6 Close all windows
- 25.** Have you ever been in an area that has had a chemical spill? Yes No
- 26.** Which would you do if a chemical spill happened in your area? Circle all that apply.
- 1 Tune to local radio or TV station and follow instructions
 - 2 Run outside and take cover
 - 3 Shelter in place

27. What would you do if a tsunami was coming? Circle all that apply.
- 1 Stay inside
 - 2 Run outside and take cover
 - 3 Go at least 1/2 mile inland or 100 feet above sea level
 - 4 Watch for the sea wave to come
28. Have you ever been involved in an education program that informed you about hazards and what to do if an emergency happens? Yes No
29. If yes, where? **Check all that apply** School Outside School
30. Who taught the program: **Check all that apply:**
- Teacher
 - Emergency management
 - Fire
 - Law Enforcement
 - Others
(Name) _____
-
31. Has your school ever encouraged you to talk with your parents about emergencies/hazards? Yes No
32. Have you ever gone home and told your parents about what you learned about hazards? Yes No
33. If so, were your parents willing to discuss how to be prepared? Yes No
34. Does your family have an emergency plan that tells you how to act during an emergency? Yes Not sure No
35. Have you ever practiced what to do in an emergency at school? Yes No
36. Does your family have a plan of your house showing exits, and where to turn off water, electricity, gas? Yes Not sure No
37. In an emergency family members may be widely dispersed – some at home, some at work and some at school. Do you have a place to meet at a safe location? Yes Not sure No
- If yes, where? _____
38. In an emergency, do you have a plan for how to contact your parents? Yes Not sure No

39. Has your family done any of the following to prepare for a hazard or emergency?

(Circle the appropriate responses)

1	Have a working flashlight	Yes No, but intend to No
2	Re-arranged breakable household items	Yes No, but intend to No
3	Put strong latches on cabinet doors	Yes No, but intend to No
4	Stored hazardous materials safely	Yes No, but intend to No
5	Added lips to shelves to keep things from sliding off	Yes No, but intend to No
6	Strapped water heater	Yes No, but intend to No
7	Installed flexible piping to gas appliances	Yes No, but intend to No
8	Braced house walls	Yes No, but intend to No
9	Bolted house to foundation	Yes No, but intend to No
10	Arranged bracing for pile foundation	Yes No, but intend to No
11	Stockpiled water and food for three days	Yes No, but intend to No
12	Have a transistor radio and spare batteries	Yes No, but intend to No
13	Have a fire extinguisher	Yes No, but intend to No
14	Have a smoke detector	Yes No, but intend to No
15	Have a first aid kit	Yes No, but intend to No
16	Stored emergency equipment (e.g. flashlight, fire extinguisher)	Yes No, but intend to No
17	Put spanner or wrench by gas turn-off valve	Yes No, but intend to No
18	Picked an emergency contact person outside your area	Yes No, but intend to No
19	Someone in family has learned how to put out fires	Yes No, but intend to No
20	Bought additional insurance (e.g., home)	Yes No, but intend to No
21	Someone in family has learned to provide first aid	Yes No, but intend to No
22	Found out if you are in an area particularly vulnerable	Yes No, but intend to No
23	Had your home inspected for earthquake resistance	Yes No, but intend to No
24	Have a family emergency plan	Yes No, but intend to No
25	Have a house plan showing exits, assembly areas, where to turn off water, electricity, gas	Yes No, but intend to No
26	Know who is responsible for collecting children from school	Yes No, but intend to No
27	Know where child would meet family or where to leave a message if everyone can't be at home	Yes No, but intend to No
28	Looked for information on preparing for emergencies	Yes No, but intend to No

- 40.** Which volcano do scientists consider most likely to erupt next?
1. Mount St. Helens
 2. Mount Baker
 3. Mount Rainier
 4. Mount Adams
- 41.** Which volcano hazard places your home at greatest direct risk?
1. Volcanic ash
 2. Volcanic gases
 3. Volcanic mudflows
 4. Lava flows
- 42.** Which volcano hazard places your school at greatest direct risk?
5. Volcanic ash
 6. Volcanic gases
 7. Volcanic mudflows
 8. Lava flows
- 43.** Earthquakes in the Puget Sound lowlands cause volcanic eruptions
1. Yes
 2. Not sure
 3. No
- 44.** Where would you prefer to seek and get information about future volcanic activity in Washington State?
1. TV and radio
 2. Your local library
 3. Internet
 4. School
 5. Emergency responders (police, fire, etc.)
 6. Other_____

45. For these final questions, please put the number that corresponds with your response. Choose a number from the scale below that shows how much you agree or disagree with each of the following statements.

	Agree strongly ← (scale) → Disagree strongly				
	1	2	3	4	5
Preparing for volcanic activity can protect myself and my family.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Preparing for volcanic activity can reduce damage to our home	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
I am motivated to prepare for future volcanic activity or other hazards	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
My family is motivated to prepare for future volcanic activity or other hazards	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Preparing for volcanic activity or other future hazard is a responsibility of our whole community	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

46. Choose a number from the scale below that shows how much you agree or disagree with each of the following statement.

The ultimate responsibility to protect us from volcanic and other hazards rests with which groups.

	Agree strongly ← (scale) → Disagree strongly				
	1	2	3	4	5
Federal Government	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
State Government	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Local Government	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
My school	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Myself and my family	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5



www.gns.cri.nz

Principal Location

1 Fairway Drive
Avalon
PO Box 30368
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4600

Other Locations

Dunedin Research Centre
764 Cumberland Street
Private Bag 1930
Dunedin
New Zealand
T +64-3-477 4050
F +64-3-477 5232

Wairakei Research Centre
114 Karetoto Road
Wairakei
Private Bag 2000, Taupo
New Zealand
T +64-7-374 8211
F +64-7-374 8199

National Isotope Centre
30 Gracefield Road
PO Box 31312
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4657