Preliminary Avalanche Accident Report for February 17, 2001

Lake Ann, Central Washington Cascades, WA

One snowmobiler caught, buried and killed

Accident Narrative— by John Stimberis, WSDOT Avalanche Control Technician—Snoqualmie Pass

Avalanche Details:

42 degree NW slope

Fracture of 1.5' in new snow, the slide later broke into old snow (unknown if it was gouging or a step fracture)

Debris was 1'-5' deep at the toe of the slide.

The weather at the time of the incident was partly cloudy with increasing clouds and snow by evening.

One snowmobiler caught and buried; he died before extrication due to trauma.

A fatal avalanche incident involving a snowmobiler occurred on February 17, 2001 near Lake Ann in the Wenatchee National Forest. Lake Ann is 19 miles due north of Cle Elum in the Cascade Mountains of Central Washington State. According to Kittitas County Sheriff Deputy and SAR coordinator Fred Slyfield, this is what occurred:

In the mid-afternoon on February 17, 2001 a group of 12 snowmobilers were riding in the area near Lake Ann when the group decided to travel up to the main lake from a smaller pond know as Little Lake Ann. Two members of the group rode across and up a slope having a SW to NW aspect. A shallow gully about 200' wide was crossed along the way. The third rider crossed the same slope about 15' above the first two tracks. This triggered an avalanche, which swept him and his machine down slope. This was unnoticed by the two lead riders. The next few members of the group arrived to see the avalanche debris and the windshield of the sled and continued to the lake, not knowing that it was their friend's machine. It was at the lake when they realized that a member of the group was missing and remembered the fresh avalanche debris along their route.

The group returned to the site and determined that the machine in the debris was their friend's machine. They began to search for him; unfortunately, there were only two shovels and two probes in the group and no transceivers. One member of the group was a SAR volunteer and he left the scene with two cell phones to call for help. Kittitas County SAR was notified at 4:20pm. After several hours, the victim was found about 250 yards below the fracture line. He was buried 18" deep and was located about 60' from his machine. The slope is open where the rider was caught, but then runs into some light timber. The rider struck the first tree below where he was caught, causing his helmet to be removed from his head. It is likely that he died on impact.

Geographically, Snoqualmie Pass lies on the crest of the Cascade Mountains and receives a large amount of precipitation, whereas Mission Ridge is located approximately 50 miles east of the crest in a

much drier location. Lake Ann is located almost halfway between these two sites. The main crest of the Cascades runs in a SSE-NNW trend, making a right angle with the main storm tack resulting in a wet west side and a dry east side. Mission Ridge and Lake Ann are located east of the main crest on an E-W sub-range within the greater Cascade Mountain Range. Thus, storms tracking from the S-SE give these locations a much better chance of precipitation. Lake Ann receives more snowfall locally as it sits on the western edge of the sub-range near Mt. Stuart (elev. 9400') at an elevation of 6200'. Conditions at this location throughout the winter are a transition between the wet crest and the dry east. Moderate snowfall and cold clear nights are much more likely, as well as the corresponding snow problems of a colder, drier climate.

No local weather data exists for the area of the avalanche. Regionally the system that produced the precipitation for this period came in from the S-SE. The following weather information is from Snoqualmie Pass, WA Station #342 (3022') and Mission Ridge Ski Area (6740').

Mission Ridge had no new snow on the 15th, 5" new (0.27") on the 16th, and 0" on the 17th. Temperatures at the mountain top site were in the low teens throughout the period with temperatures reaching the low 20's by the day of the 17th. Winds were typically E-SE throughout the period averaging 10-15mph. The winds then shifted to W 15-20 on the 17th.

Snoqualmie Pass had a bit more precipitation during the period as is expected due to its location on the crest. The 15th saw 3" new (0.28"WE), the 16th had 9" (0.68"WE) and the 17th had 5" new (0.39"WE). Temperatures at the higher elevations were warm to begin, either at or above freezing, but then dropped rapidly to the low 20's and upper teen's. Winds throughout the period were predominately ESE-SE with averages between 10-15 mph.

Ancillary Weather and Avalanche Information:

Discussion, data and forecasts provided by Mark Moore, NWAC

Remote Weather Data—

As discussed in the narrative above, the weather leading up to the accident was marginal at best. The two day weather data for the closest NWAC remote telemetry site—the Alpental weather station (about 20 miles to the west)—clearly shows strong east to northeast ridgetop winds during precipitation on the 16th at around the 5500 ft level (very comparable to the avalanche starting zone of the Lake Ann accident). In fact the winds increased and were quite strong at the 5 to 6000 ft level through the time of the accident (averaging 20-30 with gusts reaching 35-50+). With the associated low temperatures it is likely that the new snow was very susceptible to wind transport, hence depositing this new snow as a relatively hard slab over a variety of potential weak layers including surface hoar and lower density snow received earlier in the week. The presence of these weak layers and the generally low temperatures probably helped ensure a relatively poor bond to the underlying old melt freeze crust, and helping result in the ensuing highly unstable snowpack.

Remote Weather Data for Alpental Ski Area, WA for 2/17-2/18/01

Snoqualmie Pass (Alpental), Wash. 02/17/01 0300 PST

Wind sensors unheated

DATE	TIME	TEMP	TEMP	TEMP	RH	WIND	SPEED	(MPH)	WDIR	PREC	PREC	SNOW	DEPTH
MmDd	(PST)	DegF	DegF	DegF	%	MIN	AVG	MAX	AVG	(1HR)	ACCUM	24hr	Total
2001	Hour	5400	4300	3120	3120	5530	5530	5530	5530	3120	3120	3120	(in.)
02/17	0300	25	16	20	91	20	38	58	85	0.00	0.45	4	85
02/17	0200	27	16	20	91	24	35	53	88	0.00	0.45	4	85
02/17	0100	27	17	20	///	18	28	45	85	0.00	0.45	4	85
02/17	0000	26	17	21	///	13	25	36	85	0.00	0.45	4	85
02/16	2300	26	17	21	92	11	20	34	75	0.00	0.45	4	85
02/16	2200	28	17	21	92	11	18	26	69	0.00	0.45	4	85
02/16	2100	27	17	21	91	8	16	23	70	0.00	0.45	4	85
02/16	2000	28	18	22	91	9	14	21	80	0.00	0.45	4	85
02/16	1900	27	18	22	91	8	14	22	87	0.02	0.45	45	87
02/16	1800	27	18	23	91	8	14	20	88	0.04	0.43	4	86
02/16	1700	26	19	24	90	8	13	20	86	0.02	0.39	4	86
02/16	1600	26	19	24	89	9	16	26	79	0.02	0.37	2	85
02/16	1500	25	20	25	87	9	18	28	80	0.03	0.35	2	86
02/16	1400	25	20	24	87	9	20	28	84	0.04	0.32	3	86
02/16	1300	23	19	24	87	8	19	33	92	0.06	0.28	2	83
02/16	1200	21	19	23	90	10	19	29	98	0.05	0.22	2	81
02/16	1100	21	19	23	88	10	20	33	94	0.02	0.17	1	84
02/16	1000	20	18	23	88	12	23	35	99	0.01	0.15	1	82
02/16	0900	19	17	22	90	7	21	32	95	0.00	0.14	1	85
02/16	0800	17	17	21	92	1	7	28	94	0.02	0.14	1	85
02/16	0700	16	16	21	91	1	5	9	102	0.02	0.12	1	80
02/16	0600	17	17	21	91	3	6	10	106	0.01	0.10	0	228
02/16	0500	17	17	21	92	3	7	12	108	0.05	0.09	8	228
02/16	0400	17	17	21	91	4	8	13	107	0.04	0.04	8	82
DATE	TIME	TEMP	TEMP	TEMP	RH	WIND	SPEED	(MPH)	WDIR	PREC	PREC	SNOW	DEPTH
MmDd	(PST)	DegF	DegF	DegF	%	MIN	AVG	MAX	AVG	(1HR)	ACCUM	24hr	Total

Snoqualmie Pass (Alpental), Wash. 02/18/01 0300 PST

Wind sensors unheated

DATE	TIME	TEMP	TEMP	TEMP	RH	WIND	SPEED	(MPH)	WDIR	PREC	PREC	SNOW	DEPTH
MmDd	(PST)	DegF	DegF	DegF	%	MIN	AVG	MAX	AVG	(1HR)	ACCUM	24hr	Total
2001	Hour	5400	4300	3120	3120	5530	5530	5530	5530	3120	3120	3120	(in.)
02/18	0300	28	23	26	94	7	15	24	97	0.01	0.05	1	86
02/18	0200	28	23	26	93	8	17	24	100	0.01	0.04	1	87
02/18	0100	27	23	26	92	9	18	27	105	0.03	0.03	0	82
02/18	0000	27	24	26	90	2	16	27	87	0.00	0.00	0	86
02/17	2300	26	23	26	89	6	19	34	91	0.00	0.00	0	86
02/17	2200	27	23	26	90	7	20	35	85	0.00	0.00	0	86
02/17	2100	27	23	26	90	7	21	34	80	0.00	0.00	0	86
02/17	2000	27	24	26	89	12	24	37	79	0.00	0.00	0	86
02/17	1900	27	23	26	88	12	25	39	80	0.00	0.00	0	85
02/17	1800	26	23	27	86	13	28	45	80	0.00	0.00	0	86
02/17	1700	28	24	28	84	15	27	40	72	0.00	0.00	0	86
02/17	1600	28	25	30	82	7	21	37	97	0.00	0.00	0	86
02/17	1500	30	26	31	79	9	26	46	70	0.00	0.00	0	85
02/17	1400	29	25	30	81	11	23	38	77	0.00	0.00	0	86
02/17	1300	29	25	30	80	11	23	36	82	0.00	0.00	0	85
02/17	1200	27	24	28	84	14	23	36	83	0.00	0.00	0	86
02/17	1100	28	24	28	82	12	22	38	88	0.00	0.00	0	85
02/17	1000	26	21	26	86	14	25	37	77	0.00	0.00	0	84
02/17	0900	27	20	24	89	17	27	36	71	0.00	0.00	0	85
02/17	0800	24	19	22	90	15	27	41	73	0.00	0.00	0	85
02/17	0700	25	19	22	///	17	29	43	82	0.00	0.00	4	86
02/17	0600	22	18	21	///	17	31	46	81	0.00	0.00	4	85
02/17	0500	23	17	21	92	21	34	52	81	0.00	0.00	4	85
02/17	0400	25	17	20	91	19	35	56	84	0.00	0.00	4	85
DATE	TIME	TEMP	TEMP	TEMP	RH	WIND	SPEED	(MPH)	WDIR	PREC	PREC	SNOW	DEPTH
MmDd	(PST)	DegF	DegF	DegF	%	MIN	AVG	MAX	AVG	(1HR)	ACCUM	24hr	Total

Forecast information—

As a result of a variety of weather data and forecast model information, as well as snowpack stability and avalanche control information from the field, an avalanche warning for generally high danger above 3 to 4000 feet was indicated in the forecast issued the day before the accident. While this warning was

for Friday the 16th, the day before the accident, it nevertheless described the increased danger that had recently developed on the same slope exposures on which the accident occurred—"*In areas receiving recent heavy snowfall, unstable wind slabs ranging up to 12 to 24 inches or more are likely on a variety of exposures as moderate winds transport higher density wind slab snow onto primarily west and northwest exposures in north-central Washington*". Also, as is also seen from the forecast, only a slight decrease in the danger was expected overnight and early Saturday, with a considerable danger expected to continue below 7000 feet on Saturday, the 17th.

NWAC Avalanche forecast issued Friday morning, February 16th—

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ZCZC SEASABSEA COR

TTAA00 KSEA DDHHMM

WAZ012-017-018-019-025-042-ORZ011-171700-

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NORTHWEST WEATHER AND AVALANCHE CENTER

NWAC Program administered by USDA-Forest Service with cooperative funding and
support from Washington State Department of Transportation National Weather Service
National Park Service Washington State Parks and Recreation Commission Pacific
Northwest Ski Area Association and other private organizations

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BACKCOUNTRY AVALANCHE FORECAST FOR THE OLYMPICS, WASHINGTON CASCADES AND MT HOOD
AREA

These forecasts apply to back country avalanche terrain below 7000 feet. They do
not apply to highways or operating ski areas.

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0900 AM PST Friday, February 16, 2001

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ZONE AVALANCHE FORECASTS.....

WASHINGTON CASCADES FROM STEVENS PASS SOUTHWARD. . .OLYMPICS. . .

. . . . . ..AVALANCHE WARNING. . . . . .

Considerable avalanche danger below 7000 feet increasing Friday morning and early
afternoon and becoming high above 3 to 4000 feet and considerable below. Slightly
decreasing danger expected later Friday afternoon through early Saturday and
becoming considerable below 7000 feet. Danger gradually increasing again Saturday
afternoon and evening, becoming high above 4 to 5000 feet and considerable below.
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WASHINGTON CASCADES NORTH OF STEVENS PASS. . . MT HOOD AREA. . .

Considerable avalanche danger above 5 to 6000 feet and moderate danger below slightly increasing Friday morning and early afternoon and becoming considerable above 4 to 5000 feet and moderate below. Slightly decreasing danger expected later Friday afternoon through early Saturday and becoming considerable above 5 to 6000 feet and moderate below. Danger gradually increasing again Saturday afternoon and evening, becoming considerable above 4 to 5000 feet and moderate below.

SUNDAY OUTLOOK. . .

Slightly decreasing danger expected later Saturday night and early Sunday, but considerable to high danger is expected to persist Sunday morning before slowly decreasing Sunday afternoon and night.

SNOWPACK ANALYSIS.....CORRECTED. . .

Prior to arrival of increasing winds and increasing light snowfall in the north-central Cascades Wednesday night and moderate to heavy snowfall late Thursday through early Friday, a variety of snow surfaces existed in most areas. These snow surfaces included a breakable sun or melt-freeze crust on sun- exposed southeast through southwest facing terrain, gradually strengthening low density snow on shaded northeast through northwest exposures and areas of surface hoar on a variety of shaded and wind sheltered slopes. Also some slowly stabilizing shallow wind slabs remained on mostly west and southwest exposures as surface snow strengthened from daytime warming on Wednesday. However, light to moderate snowfall, strengthening winds and significant cooling spread southward late Wednesday night and early Thursday. This was followed by moderate to heavy snowfall-mainly in the Olympics and Washington Cascades from Stevens Pass southward--and moderate to strong winds later Thursday afternoon and night. Moderate to occasionally heavy snowfall is continuing in the south-central Cascades and Olympics early Friday morning, with lighter snowfall reported in the north Cascades and Mt Hood areas. Field reports indicate significant wind transport of new snow in most areas, and sensitive slides of 8-12 inches or more quickly ran long distances during avalanche control early Friday. These newly developing and generally higher density wind slabs were deposited over and are poorly bonded to weak snow layers or snow surfaces that include an old melt-freeze crust, surface hoar or weak low density snow received early Wednesday. As a result of this relatively unstable snowpack structure, a considerable avalanche danger exists in the Olympics and Washington Cascades from Stevens Pass southward below 7000 feet, with unstable slabs ranging up to 1 to 2 feet probable in steeper lee terrain. In the northern Washington Cascades and Mt Hood area less recent snowfall was received. . .however, increased winds and light to moderate snowfall have probably still created a considerable danger above 5 to 6000 feet, with smaller unstable slabs possible at lower elevations on lee slopes.

Also, recent and expected continuing cold temperatures in the north-central Cascades, Cascade passes and Cascade east slopes should once again allow for more faceting and weakening of snow near several buried crusts and near the recent surface snow that had warmed substantially Wednesday, especially on sun-exposed terrain. This faceting should help keep much of the upper part of the snowpack relatively weak, and susceptible to stress failure and fracture if future heavy loading is received. Hence surface slide releases of the most recently deposited snow may trigger some isolated larger slides involving all of the snow since early-mid January, with releases of 2-4 feet possible.

FRIDAY. . FRIDAY NIGHT. . .CORRECTED. . .

Moderate to occasionally heavy snowfall is expected Friday morning, heaviest along the south-southeast slopes of the Olympics, along the Cascade east slopes and near the Cascade passes, with generally lighter amounts in the north Cascades and near Mt Hood. Along with moderate winds and slow warming, mainly in the south, this should produce a further increase in the avalanche danger, with high danger likely developing above 3 to 4000 feet and considerable danger below-in the Olympics and south-central Washington Cascades and a slightly lower danger elsewhere. In areas receiving recent heavy snowfall, unstable wind slabs ranging up to 12 to 24 inches or more are likely on a variety of exposures as moderate winds transport higher density wind slab snow onto primarily west and northwest exposures in north-central Washington and northeast through northwest exposures in southern Washington and the Mt Hood area. With snowfall expected to gradually decrease in the south by early afternoon and in the north mid-late afternoon with generally light to moderate showers and briefly decreasing winds Friday night, this should allow for a slow decrease in the danger as recent wind slabs begin to settle.

SATURDAY. . .SATURDAY NIGHT. . .

Light showers early Saturday should increase in the south later Saturday morning, with increasing light to moderate rain or snow spreading northward mid-day through Saturday afternoon. Along with slight warming and moderate winds, this should result in gradually increasing danger as new soft wind slabs are deposited over an already unstable snowpack. Greatest danger should continue on northwest through southwest facing slopes near the Cascade passes and northeast through northwest exposures elsewhere, and back country travel is not recommended on steeper terrain showing evidence of recent wind transport.

SUNDAY. . .

Decreasing and more showery precipitation with decreasing winds and slight cooling expected late Saturday night and early Sunday should produce a slight decrease in the danger. However, light to moderate rain or snow and increasing winds Sunday morning should help maintain or slightly increase existing considerable to high danger. Gradually decreasing winds and showers mid-late Sunday should allow for a slow decrease in the danger as new wind slabs slowly settle. However, travelers should continue to assess snowpack stability often and travel on wind loaded terrain is not recommended.

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Backcountry travelers should be aware that elevation and geographic distinctions are approximate and a transition zone between dangers exists. Remember there are avalanche safe areas in the mountains during all levels of avalanche danger. Contact local authorities in your area of interest for further information.

NWAC Mountain Weather Forecasts and mountain weather data are also available by visiting our Web site at www.nwac.noaa.gov.

Moore/Forest Service Northwest Weather and Avalanche Center

As shown below in the forecast issued on the morning of the accident, Saturday the 17th, the snowpack analysis section continued to stress the potential for sensitive slabs on lee slopes—"*a considerable*

danger remains below 7000 feet with unstable wind slabs ranging up to 1 to 3 feet probable in wind loaded terrain-primarily west through northwest facing slopes". Once again the data pointed to west through northwest exposures as being the most heavily loaded and avalanche prone, with even a further increase expected in the danger during the afternoon of the accident.

NWAC Avalanche forecast issued Saturday morning, February 17th—

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ZCZC SEASABSEA

TTAA00 KSEA DDHHMM

WAZ012-017-018-019-025-042-ORZ011-181700-

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NORTHWEST WEATHER AND AVALANCHE CENTER

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BACKCOUNTRY AVALANCHE FORECAST FOR THE OLYMPICS, WASHINGTON CASCADES AND MT HOOD
AREA These forecasts apply to back country avalanche terrain below 7000 feet. They
do not apply to highways or operating ski areas.
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0845 AM PST Saturday, February 17, 2001

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ZONE AVALANCHE FORECASTS.....

WASHINGTON CASCADES FROM STEVENS PASS SOUTHWARD. . .OLYMPICS. . .

Considerable avalanche danger below 7000 feet gradually increasing Saturday
afternoon through Sunday morning, possibly becoming high above 3 to 4000 feet and
considerable below. Danger slowly decreasing Sunday afternoon and night and
becoming considerable above 4 to 5000 feet and moderate below.

WASHINGTON CASCADES NORTH OF STEVENS PASS. . .

Considerable avalanche danger above 5 to 6000 feet and moderate below gradually
increasing Saturday afternoon through Sunday morning and becoming considerable
above 4 to 5000 feet and moderate below. Danger decreasing Sunday afternoon and
night and becoming considerable above 5 to 6000 feet and moderate below.

MT HOOD AREA. . .

Considerable avalanche danger above 6000 feet and moderate below gradually
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increasing Saturday afternoon through Sunday morning and becoming considerable above 5000 feet and moderate below. Danger decreasing Sunday afternoon and night and becoming considerable above 6000 feet and moderate below.

MONDAY OUTLOOK. . .

Gradually increasing danger is expected mid-late Monday, mainly from the central Washington Cascades southward, with relatively little change in the danger further north.

SNOWPACK ANALYSIS.....

Moderate to heavy snowfall-heaviest in the Olympics and Washington Cascades from Stevens Pass southward--and moderate to strong winds late Thursday and Friday were followed by decreasing showers but continued relatively strong winds late Friday through early Saturday. Although this allowed for a slight decrease from the recent high danger in the south-central Cascades, a considerable danger remains below 7000 feet with unstable wind slabs ranging up to 1 to 3 feet probable in wind loaded terrain-primarily west through northwest facing slopes. During the past 24 hours, field reports indicate significant wind transport of new snow in most areas, and sensitive slides of 1 to 2 feet or more quickly ran long distances during avalanche control Friday. Although some settlement of these slabs has occurred, many of these newly developing and generally higher density wind slabs were deposited over and remain poorly bonded to weak snow layers or snow surfaces that include an old melt-freeze crust, surface hoar or weak low density snow received early Wednesday. Also, moderate to strong winds early Saturday are continuing to build larger slabs, with some hollow sounding hard slabs likely forming over weak snow below ridges. Finally, recent cold temperatures in the north-central Cascades, Cascade passes and Cascade east slopes should be once again allowing for more faceting and weakening of snow near several buried crusts and near the recent surface snow that had warmed substantially last Wednesday. This faceting should help keep much of the upper part of the snowpack relatively weak, and susceptible to stress failure and fracture if future heavy loading is received, such as that being experienced currently from strong wind transport. Hence surface slide releases of the most recently deposited snow may trigger some isolated larger slides involving all of the snow since early-mid January, with isolated releases of 2-4 feet or more possible in heavily wind loaded terrain.

Generally less snowfall received in the north Cascades and Mt Hood areas since mid-week is producing a slightly lower danger, however a similar unstable snow structure exists and a considerable danger exists on lee slopes above about 5000 feet in the north Cascades and above 6000 feet in the Mt Hood area. At lower elevations in these areas less winds are resulting in a moderate danger with smaller slabs possible in wind affected terrain-mainly northwest through northeast exposures near Mt Hood and north through west exposures in the north Cascades.

SATURDAY. . .SATURDAY NIGHT. . .

Increasing clouds are expected Saturday morning with light rain or snow developing in the south mid-day or early Saturday afternoon, spreading northward later Saturday afternoon and evening. Light to moderate rain or snow is expected Saturday night and early Sunday, heaviest in the south-central Cascades and along the Cascade east slopes. Along with slight warming and moderate winds, this should result in gradually increasing danger as new soft wind slabs are deposited over an already unstable snowpack including some rather unpredictable hard slabs. Greatest danger should continue on northwest through southwest facing slopes near the Cascade passes and northeast through northwest exposures elsewhere, and back country travel is still not recommended on steeper terrain showing evidence of

recent wind transport.

SUNDAY. . .

Although light to moderate rain or snow should decrease and become more showery Sunday morning, further slight warming is also expected with the effects being most pronounced near the Cascade passes. This should help to further slightly increase existing avalanche danger with a high danger possibly developing above 3 to 4000 feet, especially near the central Cascade passes. In areas near the Cascade passes, most slopes have been under the influence of a cold easterly pass flow since early Thursday, and a pass wind shift to briefly warmer westerly may substantially increase the danger as brief wet snow or rain is possible below 3 to 4000 feet. Gradually decreasing winds mid-late Sunday through early Monday along with slightly lowered freezing levels-mainly in the north--should allow for a slow decrease in the danger as new wind slabs slowly settle. However, travelers should continue to assess snowpack stability often and travel on wind loaded terrain is not recommended.

MONDAY. . .

After a brief decrease in showers and some partial clearing, increasing clouds and light to occasionally moderate rain or snow should spread northward mid-late Monday. However, most of this precipitation should remain in the south-central Cascades and Mt Hood area with only light showers expected further north. Along with only a slight rise in freezing levels and mostly light to moderate winds this should only produce a slight increase in the danger, mainly in the southern and central Washington Cascades and Mt Hood area where further small wind slabs should develop. Further north, mainly light showers and little or no warming are expected to produce little change in the avalanche danger.

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Backcountry travelers should be aware that elevation and geographic distinctions are approximate and a transition zone between dangers exists. Remember there are avalanche safe areas in the mountains during all levels of avalanche danger. Contact local authorities in your area of interest for further information.

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