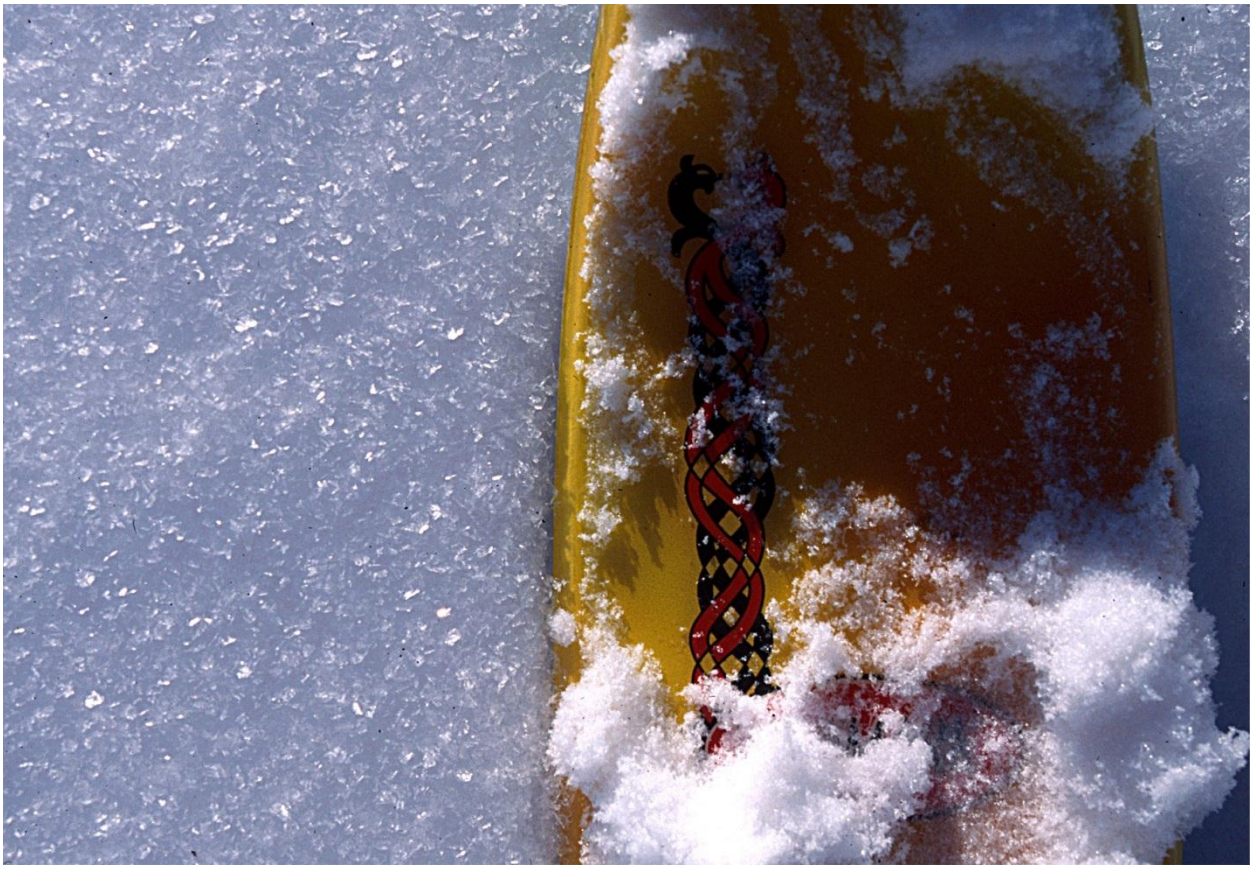
Northwest Weather and Avalanche Center



2003-2004 Annual Report

Report prepared by Garth Ferber, Kenny Kramer and Mark Moore

A partnership between the USDA Forest Service, Washington State Parks and Recreation Commission, Washington State Snowpark and Snowmobile Programs, Washington State Department of Transportation, National Weather Service, National Park Service, Pacific Northwest Ski Area Association, USDA-FS Fee-demo Program, County Title II RAC Program, Friends of the Avalanche Center and others.

United States Department of Agriculture

Forest Service Pacific Northwest Region

Cover Photo credits:

This surface hoar that formed in many mountain areas of the Northwest was produced by an upper ridge and fair weather over the region in mid-February. Once buried by subsequent snowfall the layer produced a very sensitive snow pack and significantly increased danger, particularly in the Stevens Pass area where a skier triggered avalanche swept the victim into trees. Photo by Garth Ferber, NWAC.

Northwest Weather and Avalanche Center
2003-04 Annual Report

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NORTHWEST WEATHER AND AVALANCHE CENTER

A partnership between the USDA Forest Service, Washington State Parks and Recreation Commission, National Park Service, National Weather Service, Pacific Northwest Ski Area Association, Washington State Department of Transportation, Washington State Snowpark and Snowmobile Programs, USDA Forest Service Fee Demo programs, Title II RAC programs, Ski Schools, Friends of the Avalanche Center and others.

ANNUAL REPORT—2003-2004 SEASON

Report prepared by Mark Moore, Garth Ferber, Kenny Kramer in May 2004.

A Message From the Director - Each year during the Northwest Weather and Avalanche Center's past 28 winters of operation has brought new and interesting challenges to both staff and cooperators and this past winter season was no exception. While five avalanche fatalities occurred in Washington State during the 2003/04 season the overall long term annual fatality rate for Washington and Oregon remains relatively low at about 2/year. The low accident rate and the high product use (see below) confirm the value of the program and importance of our mission. This accomplishment is largely a result of the high quality forecast, data and educational efforts expended by our dedicated staff of professional weather and avalanche forecasters. The success of NWAC also reflects well on the cooperators who have helped to make this avalanche safety program what it is today. However, in addition to the normal efforts to promote public safety through the daily forecasting and data network operations, an increasing amount of work has been dedicated toward maintaining program funding. Although recent past funding efforts have been rewarded by expanded support from PNSAA, Title II RAC and Fee Demo programs, projected reductions or flat support from several federal and state agencies will continue to challenge the NWAC in the future—Mark Moore, NWAC Director

NWAC MISSION STATEMENT

To reduce the impacts of adverse mountain weather and avalanches on recreation, industry and transportation in Washington and northern Oregon through data collection, forecasting and education. This promotion of public safety shall be accomplished by providing cooperating agencies and the public with:

- Mountain Weather Data
- Mountain Weather Forecasts
- Avalanche Forecasts
- Education
- Applied Research and Technology

How to get NWAC mountain weather and avalanche forecast information:
http://www.nwac.us (note this new Web URL will soon be our primary Internet address)
206-526-6677 (Seattle Hotline)
503-808-2400 (Portland Hotline)

How to reach us for other information:
Northwest Weather and Avalanche Center
7600 Sandpoint Way NE
Seattle, WA 98115
206-526-6164
nwac.sew@noaa.gov

OPERATIONS SUMMARY

Forecast staff at the NWAC are employed by the USDA-Forest Service from mid September through mid-June. The following is a summary of the main NWAC tasks during the 3 distinct parts of our season:

Pre-Season (mid September to mid November):

- Attend and provide input and instruction at the International Snow Science Workshop or National Avalanche School.
- Finalize and initiate annual operating plan.
- Office preparation especially of forecasting and weather station computers.
- Weather data network installation, upgrades and repairs.
- Preliminary mountain weather forecasting for ski areas, WSDOT.

Winter Season (mid November to mid April):

- Provide daily mountain weather and avalanche consultations to ski areas, WSDOT crews and other cooperating agencies, starting at 3:30 am, 7 days a week.
- Prepare and disseminate twice daily public mountain weather forecasts (7 am) and daily avalanche forecasts (9 am) 7 days a week; provide updates and special statements as necessary.
- NWAC weather station repairs; ensure reliable and highest quality data on the web site.
- Gather first hand snow pack information and snow pack information from others; integrate into avalanche forecasts.
- Provide avalanche awareness presentations as requested.
- Prepare and update web site pages with accident reports & statistics, climatological snowdepth and other educational information.

Post Season (mid April to mid June):

- Continue to provide mountain weather and avalanche consultations to cooperating agencies, such as WSDOT crews at Washington and Chinook passes.
- Issue special avalanche statements when necessary.

- NWAC weather station upgrades or repairs; continue to provide hourly weather data via web site.
- Prepare for annual meeting and issue annual report.
- Plan operations for next season.

INFORMATION EXCHANGE

INCOMING INFORMATION:

Through the winter NWAC forecasters rely on incoming information and data to make accurate assessments of current mountain weather and avalanche observations. This information comes from the following sources:

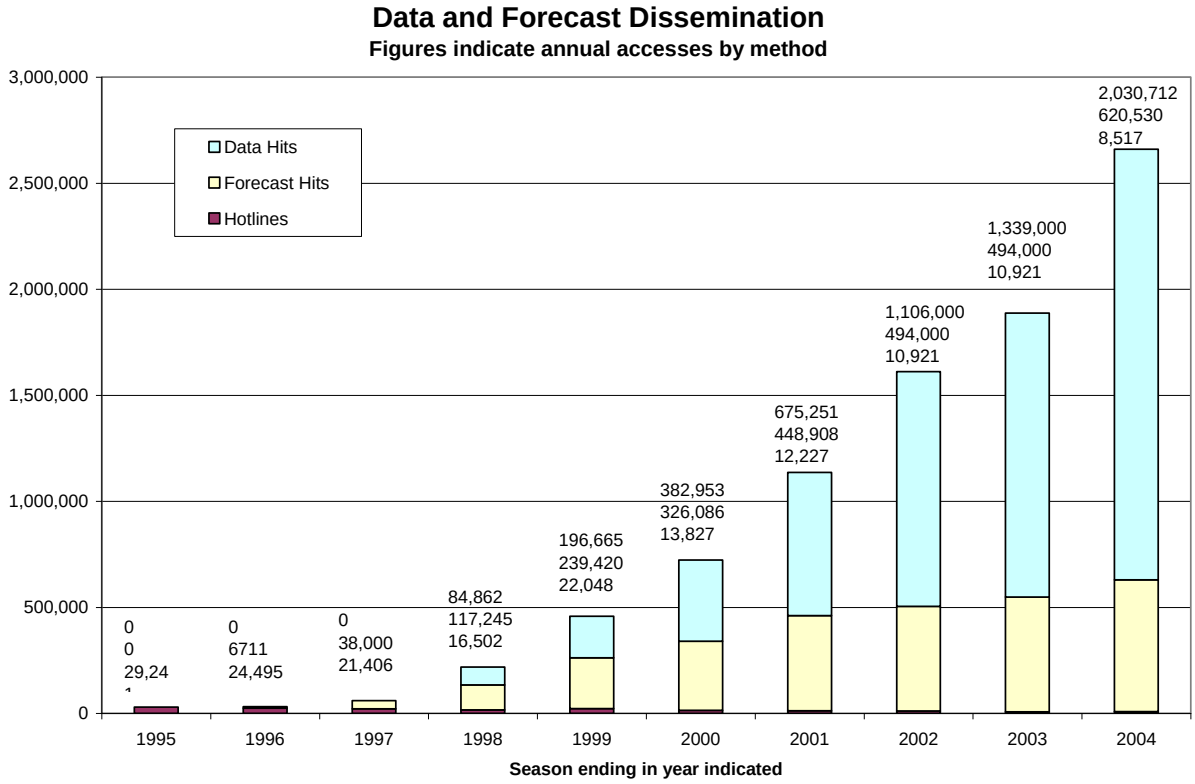
- Observer Network: The forecaster at the NWAC receives daily weather and avalanche observations via telephone from most ski areas, WSDOT crews at Stevens and Snoqualmie, and observers at Hurricane Ridge and Paradise on Mt Rainier.
- Backcountry Observations: The NWAC makes as much use as possible of available back country snow and avalanche observations via phone calls and messages, the new FOAC Snow pack Information Exchange, and the other sources on the Internet.
- NWAC Weather Stations: The NWAC currently maintains or helps maintain 42 weather stations located at NPS, WSDOT and ski area sites at Hurricane Ridge and throughout the Cascade Mountains. These stations provide temperature, relative humidity, wind, precipitation and snowfall information automatically via phone and radio connections.
- National Weather Service: NWAC staff have access to all products and expertise of the Seattle WFO (Weather Forecast Office of the National Weather Service).

OUTGOING INFORMATION:

The NWAC distributes mountain weather and avalanche information via the following means:

- Phone Consultations: daily with most ski areas, DOT crews at Stevens and Snoqualmie Passes, and observers at Paradise.
- Public Hotline Recordings: in Seattle and Portland 8517 calls this season (see chart below).
- Internet: This season we had 469,000 hits on the Mountain Weather Forecasts, 152,000 hits on the Avalanche Forecasts, 2,030,000 on the weather station data, with another 708,000 hits on other products on the NWAC web site (see figure below). Weekly product access has ranged to over 100,000 hits per week solely on data and forecasts.
- NOAA Seattle Weatherwire: Avalanche Warnings and Special Statements were sent to the media via the Weatherwire on 23 days this season.
- Search and Rescue Assistance: The NWAC provides weather and avalanche forecast assistance to County Search and Rescue teams every season.
- 15 years of archived NWAC mountain weather station data is also now available.

Figure 1. Data and forecast dissemination over the past 10 years.



2003-2004 WINTER WEATHER AND AVALANCHE SUMMARY

Heavy snow began in late November. This gave backcountry enthusiasts, the ski areas and DOT crews an early start to the season. Snowfall of 15-30 inches in 24 hours was seen on many different days at different sites in late November. The NWAC began regular winter forecasting services on 24 November.

Steady storm cycles, with mostly short 1-2 day breaks, continued through December. Especially heavy snowfall was seen the night of 13-14 December with 1-2 feet at most sites near and west of the crest. The first avalanche fatalities in the U.S. this season occurred in Washington in mid December. Two snowshoers survived a miraculous 24 hours of burial near the Mt Baker ski area from 12 to 13 December, but their partner died of hypothermia. On 13 December a snowshoer was caught and pushed under a large boulder near Alpental and rescuers needed a week to find her body. On 17 December a snowmobiler high marking near Blewett Pass, triggered a large avalanche, which buried and killed him. He was found underneath 10 feet of avalanche debris.

Storms continued into early January especially in the south Cascades. Especially heavy snow was seen again on 7 January with 20-30 inch snowfall in 24 hours at Paradise and Timberline. But the recent accidents may have helped to spread the avalanche message and there were no accidents during that time.

A period of mild weather in mid January caused major snow pack consolidation.

Cool weather and heavy snow cycles returned in late January with 10-20 inches of 24 hour snowfall common. Moderate snow cycles continued in early February. A relatively good outcome was seen when 2 snowmobilers were buried 2 and 5 feet deep respectively in an avalanche near Lake Ann in the central Cascades on 31 January. Both were rescued using transceivers. This was a large avalanche with an 18-24 inch deep fracture that was several hundred feet across.

A week of sunny weather and high freezing levels was seen the second week of February. This allowed large extensive hoar frost to form in some areas.

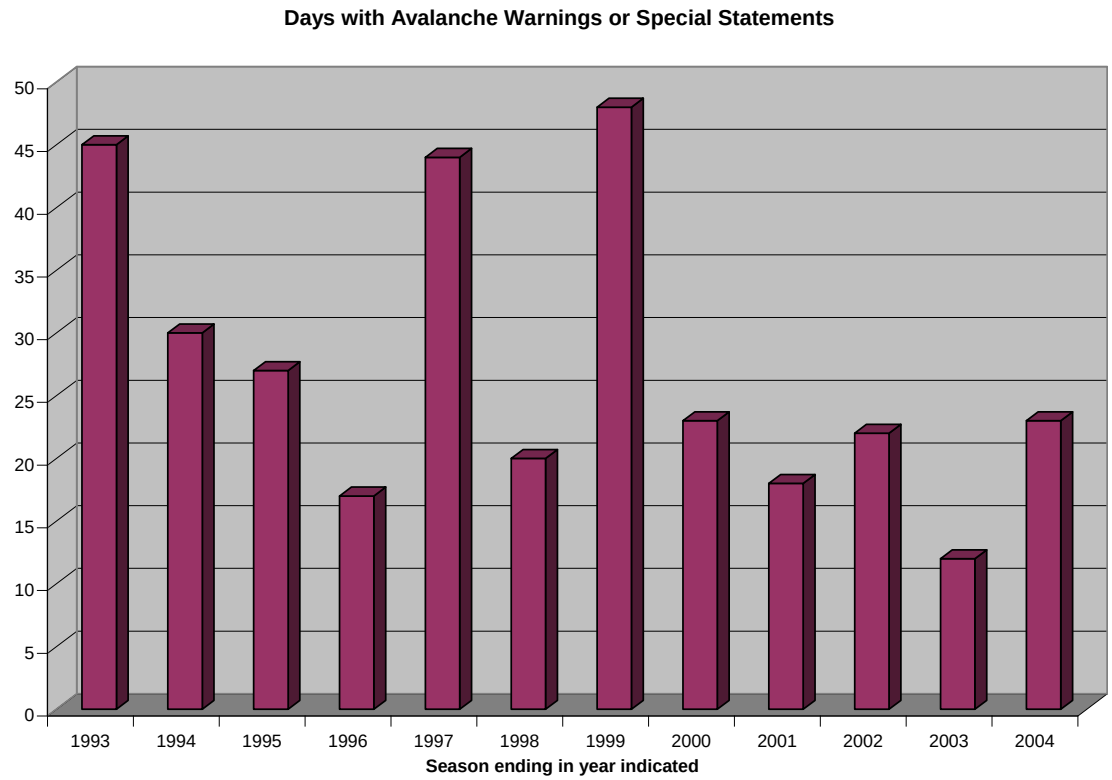
Another fairly heavy storm cycle was seen the third week of February with 5-10 inches of 24 hour snowfall common from about 16-19 February. This caused the buried hoar frost layer to become quite reactive in the vicinity of Stevens Pass, where several slab avalanches were triggered, and one person received face injuries when an avalanche carried him into a tree.

A light or moderate storm cycle near the end of February was followed by a heavy storm cycle in early March. About 5-15 inches of 24 hour snowfall was common for several days in early March. This caused several additional avalanche accidents. A snowmobiler was killed on 5 March while high marking near Salmon La Sac. He was apparently wearing a beacon but was buried 8 feet deep in avalanche debris. Two other lucky snowmobilers survived an avalanche they triggered near Stampede Pass on 6 March. One was buried upside down with his feet showing and the other nearly completely buried but with a bit of glove showing. Nearby snowmobilers were able to dig out both men in time to save their lives.

Major dry and mild periods of weather during much of the remainder of March and early April led to sort of a quiet end to winter. The NWAC ended full forecasting services on 11 April. A tragic reminder that the avalanche season is not over in the spring came on 26 April. A person snowboarding by himself near the Mt Baker ski area was killed when he was caught and partly buried in a small bergshrund by a small wet snow avalanche.

We had 23 days through the winter with warnings or special statements which is about the annual average over the last 10 years.

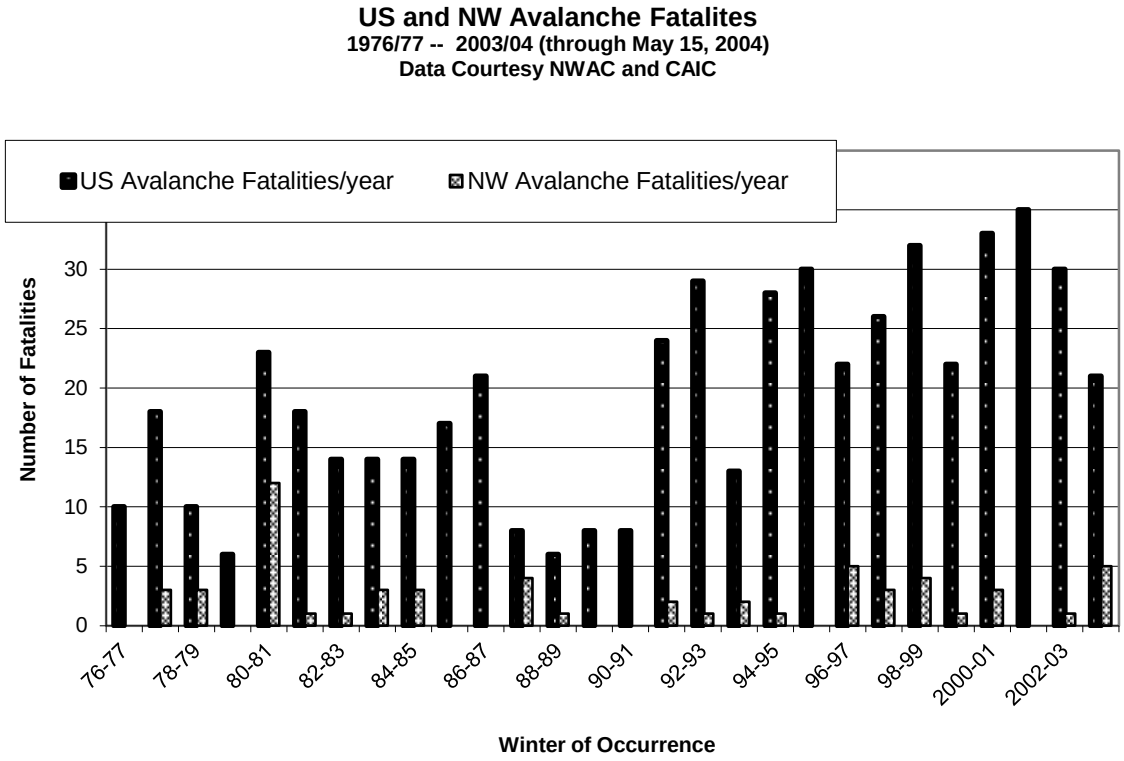
Figure 2. Days with Avalanche Warnings or Special Statements for the current and past seasons.



US AND NORTHWEST AVALANCHE ACCIDENT TRENDS

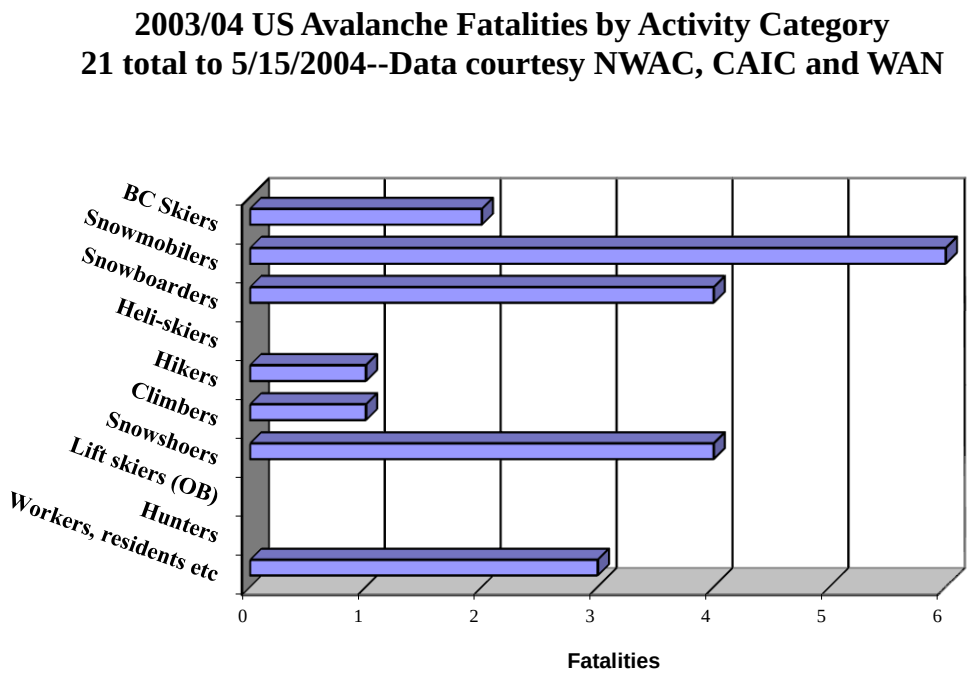
The five avalanche fatalities in Washington are the most in a season since five were also claimed in the Northwest during the 1996/97 winter. Overall the 21 avalanche fatalities so far this season nationwide is slightly less than the recent average of around 30 deaths per year. Details on avalanche accidents can be found at www.nwac.us or at www.avalanche.org. Some key annual statistics are presented below.

Figure 3. Annual US versus NW avalanche fatality chart (1976-2004)



NW data includes WA and

Figure 4. Annual US avalanche fatalities by category



2003-2004 SNOW PACK

The early season storms helped build the snow pack to above normal in both the north and south Cascades. However, by late in the season the snow pack had decreased to below normal in the north (see Mt Baker chart) and to near normal in the south (see Timberline chart). Also owing to the relatively warm and dry late winter and early spring, the snow pack at lower elevations had become well below normal (see Snoqualmie chart).

Figure 5. Current versus climatological snowdepth--Mt Baker

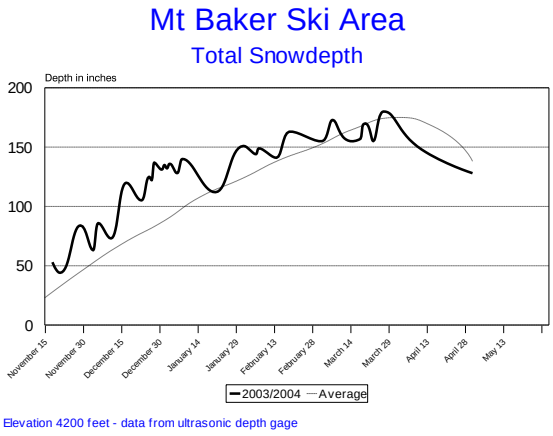


Figure 6. Current versus climatological snowdepth--Timberline Lodge

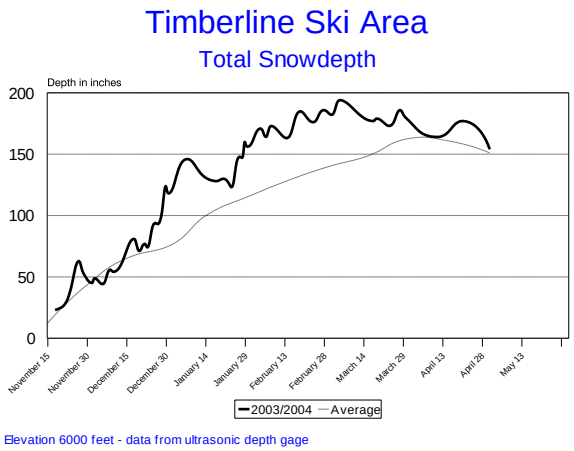
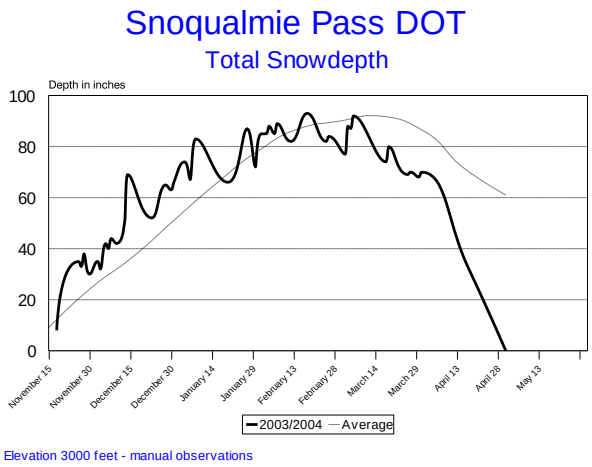


Figure 7. Current versus climatological snowdepth--Snoqualmie Pass



EDUCATION

Avalanche awareness presentations, using a slide show or Power Point, are offered by NWAC staff and FOAC volunteers on request. Full Level I, II and III avalanche classes are provided by private companies. The table below lists avalanche awareness presentations that were presented by the NWAC during the 2003-2004 season, reaching an audience of over 1600.

Table 1. Educational presentations by NWAC and FOAC

DATE	GROUP	AUDIENCE SIZE	LOCATION	SPEAKER
30 Sep – 5 Oct	National Avalanche Center, American Avalanche Association	80	Snowbird, UT	Moore
18 Oct	Snowmobile Show	35	Puyallup	Kramer
19 Oct	Snowmobile Show	20	Puyallup	Ferber
19 Oct	Pacific Northwest Ski Instructors	40	Seattle	Moore
27-31 Oct	National Avalanche School	200	Reno, NV	Moore
27-31 Oct	National Avalanche School workshops	154	Reno, NV	Moore
12 Nov	FOAC fundraiser Tractor Tavern	300	Seattle	Ferber
18 Nov	REI	10	Lynnwood	Ferber
2 Dec	Oregon Nordic Club	50	Portland	Emetaz
2 Dec	Mountaineers	30	Everett	White
4 Dec	Friends of the Avalanche Center – film fundraiser	25	Seattle REI	Ferber
6 Dec	REI Backcountry Expo	20	Seattle	White
7 Jan	Mountaineers Snowshoe class	40	Seattle	White
10,11 Jan	Northwest Avalanche Institute	25	Seattle Mountaineers	Moore
13 Jan	Olympia Mountaineers	40	Olympia	Emetaz
17 Jan	Mt Hood/REI Snowshoe Festival	100	Portland	Emetaz
17,18 Jan	Northwest Avalanche Institute	45	Crystal Mountain Ski Area	Moore
21 Jan	Boy Scouts	55	Everett	White
22Jan	Mountaineers	30	Everett	White
31 Jan, 1 Feb	Northwest Avalanche Institute	55	Crystal Mountain Ski Area	Moore
31 Jan	Alpine Safety Awareness Program	20	Mt Baker Ski Area	Kramer
7 Feb	Cabin Fever Festival	30	Trout Lake, WA	Emetaz
9 Feb	Forest Service Employees	20	Parkdale, OR	Emetaz
12 Feb	Forest Service Employees	15	Dufur, OR	Emetaz
27 Feb	Dept. of Emergency Management	30	Camp Murrary, WA	Emetaz
15 Mar	Mountaineers	75	Tacoma	Moore, Emetaz
23 Mar	Scrambler class – Mountaineers	30	Tacoma	Emetaz
6 Apr	Mountaineers	30	Everett	White
13 Apr	Skagit Alpine Club	25	Mt Vernon	Ferber
22 Apr	Mountaineers	28	Everett	White
		TOTAL =1657		

The FOAC, the US Forest Service and the NWAC also teamed up to produce and print 100,000 new Snow Avalanche information brochures late in 2003. Along with new snowmobile avalanche safety brochure procured last season, these snow safety brochures are also supplied free of charge and are available on request.

2003-2004 WEATHER STATION CHANGES AND UPGRADES

At **Stevens Pass Ski Area** we moved the Skyline CR-10 data logger to the nearby tower in late September to eliminate intermittent snow depth gage problems, replaced the Judd 2 snow depth sensor and replaced a CS500 air temperature-relative humidity sensor at the top of the Brooks chair.

At **Crystal Mountain Ski Area** we replaced the CR 10 data logger and precipitation gage in late October to solve a difficult precipitation gage problem and improve the system. We also installed a new Judd 24 hour snow depth sensor and added a new CS500 air temperature-relative humidity sensor.

At the top of **White Pass Ski Area** we installed a new set of Taylor heated wind instruments. This set is intended to replace a set a short distance to the west that is in an unrepresentative, windy location.

Our biggest project of the fall was the installation of a new weather station at **Sunrise, Mt Rainier National Park,** with enclosure, CR10X data logger, CS500 air temperature-relative humidity sensor, Judd 2 snow depth sensor and Freewave radio system. At the **Chinook Pass WSDOT** knob site we installed a new enclosure, solar panel, CR10X logger, added a CS500 air temperature-relative humidity sensor and Freewave radio system. We also added a new Freewave radio to the **Chinook Pass WSDOT** base site. The Sunrise station will act as base station in order to retrieve data from the Chinook stations.

At **Paradise, Mt Rainier National Park**, on 15 Dec 2003 we removed the old, mal-functioning weather station on the weather tower. We installed a new enclosure, new CR10X data logger, a new CS500 air temperature-relative humidity sensor, and retained the existing precipitation gage and Judd snow depth gages. Then we added a new CR10X, enclosure, and power supply to the wind instrument system at the Visitor Center. This change should bring reliable access to both the wind and precipitation sites.

At the top of the **Alpental Ski Area** we added a CR10 data logger in order to reestablish communications with the wind and temperature instruments, and to eliminate the wiring mess at the old midway site. Much of this work was done by the Snoqualmie DOT avalanche crew. This system began auspiciously logging data on 1 January.

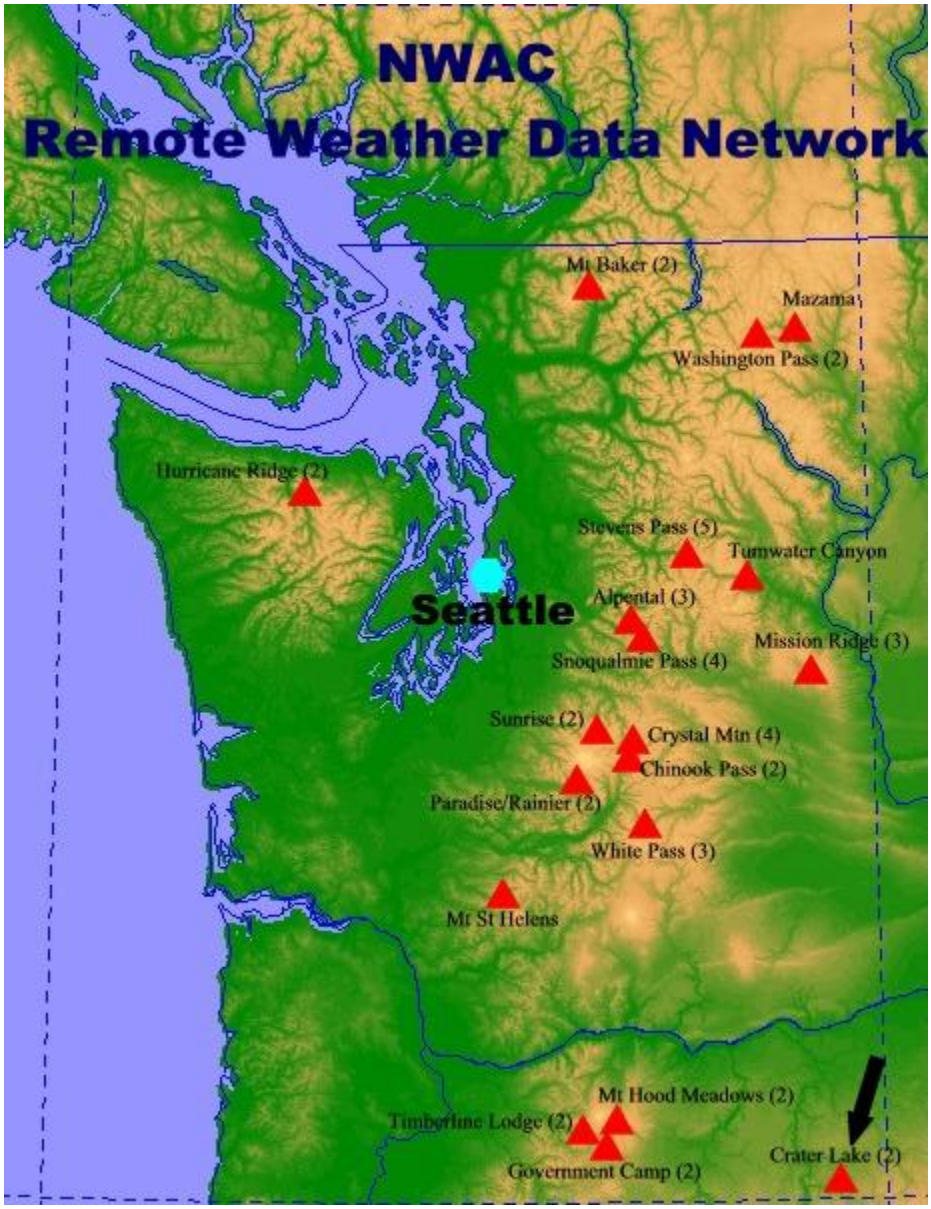
At **Mt Baker Ski Area** we replaced a mal-functioning precipitation gage on 22 January.

In order to begin to reestablish communication with the 2 weather stations at **Chinook Pass WSDOT** sites, a Freewave radio system was installed at top of Crystal Mountain ski area on 6 April. This link has provided intermittent access to the Chinook stations. In the future we plan to add an uninterruptible power supply to the top of Crystal Mountain, as well as repair the primary Freewave link from the Sunrise station in Mt Rainier National Park.

At **Stevens Pass WSDOT** Schmidt Haus we added a new CS500 air temperature/relative humidity instrument on 14 April.

Below is a map showing weather stations maintained or partly maintained by the NWAC.

Figure 8. Map of the mountain weather stations managed and maintained or partly maintained by NWAC staff.



FUTURE PLANS

- Convert **Washington Pass** weather station from a satellite system to a Campbell datalogger / radio access system working with North Central WSDOT crew.
- Install a uninterruptible power supply and new RF coax cable at the top of Crystal Mountain Ski Area for accessing the **Chinook Pass DOT** radio system.
- Continue to make improvements to weather stations such as **Hurricane Ridge**, **Mt Baker Ski Area**, **Mazama**, **Chinook Pass DOT** base site, **Ski Bowl Ski Area** and **Mt St Helens.**
- Finish moving the NWAC web site to www.nwac.us and overhaul the NWAC Web site working with the FOAC.

- Continue to improve NWAC weather station datalogger programs and weather station display on the web site.
- Install a new Cascade east slope weather station, most likely near Lake Wenatchee.

NWAC BUDGET AND FUNDING

The Forest Service and the NWAC recognize, applaud and greatly appreciate the recent and continuing contributions of all cooperators to assist funding Avalanche Center operations. While all state and federal agencies are faced with at times uncertain and declining budgets, and this will result in difficult budget decisions in the years ahead, please be assured that the Forest Service and NWAC staff will do all that is possible to ensure future normal operation of the Avalanche Center. As a result, we hope that our long and mutually beneficial relationship will continue well into the future. Please note that the NWAC is currently making presentations for several Title II grants, and has requested capital equipment support from both the National Weather Service and the Friends of the Avalanche Center.

When viewing the budget projections for FY04 and FY05 shown below, note that the following assumptions have been made:

- Unanticipated donation carryover from prior seasons, lower than anticipated premium pay (OT, hazard), and less travel for the current year will combine to allow a donation carryover of about $15,000 for Fiscal Year 2005 (FY05).
- Flat support levels will continue from the Forest Service and Washington State.
- Slightly increased support is projected from the Park Service (+3%/year).
- NWAC will apply for and receive approximately $15,000 from USDA-FS fee-demo programs and another $15,000 from Title II/RAC programs.
- Unemployment and Medical costs for forecast staff will remain at $0.
- Salaries will increase at approximately +3%/year .
- FOAC will contribute $5,000 toward capital equipment in FY05.

In order to achieve continued operation of the Center with these assumptions and no additional sources of revenue:

- Capital equipment expenditures will be progressively reduced (thru FY07).
- Travel and communication costs will be reduced (especially in the outlook years of FY06 and FY07).

Table 2. NWAC Budget--Sources of Funding for FY04 and FY05

NWAC Budget—Sources of Funding

Funding Source		FY04 [projected]	FY05 [projected]
Federal		**$111,313**	**$126,953**
	USDA-Forest Service	$75,000	$75,000
	National Park Service	$21,313	$21,953
	USDA-FS Fee Demo	$15,000	$15,000
	USDA-FS Carryover		$15,000
Washington State		**$111,500**	**$97,500**
	Parks and Recreation Commission (includes State General Fund $)	$79,000	$79,000
	Department of Transportation	$20,000	$10,000
	DOT spring forecasting	$4,000	
	Snowpark Program*	$3,500	$3,500
	Snowmobile Program*	$5,000	$5,000
County		**$32,793**	**$15,000**
	Title II/Resource Advisory Comm.	$32,793	$15,000
Private		**$15,250**	**$20,000**
	PNSAA	$15,000	$15,000
	FOAC (not included for FY04)	[$7205]	$5,000
	Other private	$250	
TOTAL FUNDING		**$270,856**	**$259,453**
Estimated In-Kind Support		**$166,770**	**$171,096**
[Indirect support]	USDA-FS (~30& of direct cont)	$22,500	$22,500
	WSDOT (obs + equip support)	$20,200	$20,806
	NPS (obs + equip support)	$4,995	$5,145
	NWS (office costs + product access etc)	$58,750	$60,510
	PNSAA (obs, power, phone etc)	$6,705	$6,905
	All (one time cost for data support)	$53,620	$55,230
GRAND TOTAL [DIRECT + INDIRECT]		**$437,626**	**$430,549**

*** Additional funds have been requested for FY05**

Figure 9. NWAC—Projected FY04 Expenditures

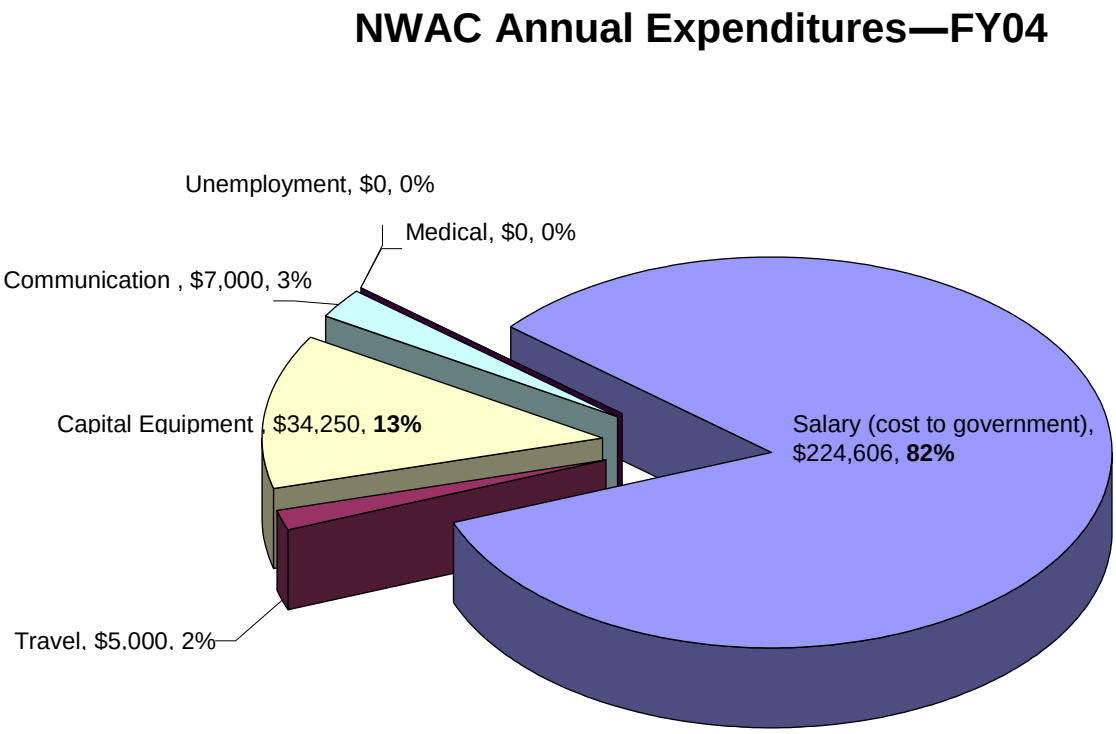
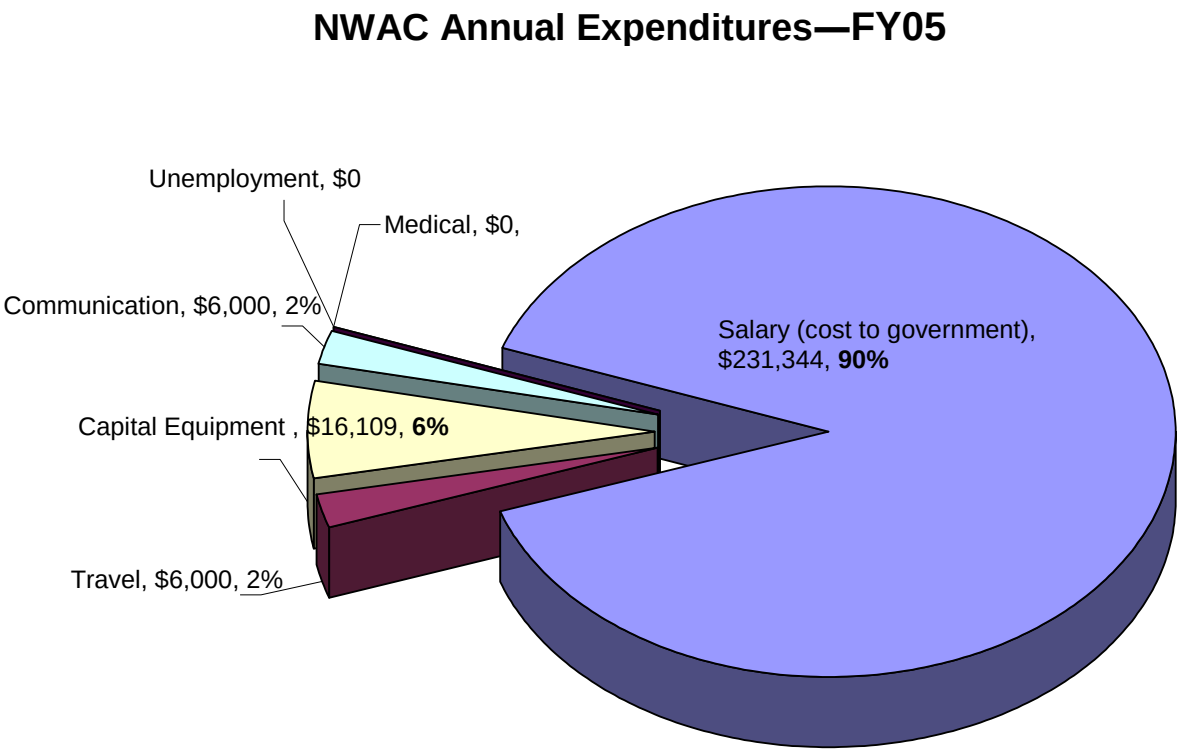


Figure 10. NWAC—Projected FY05 Expenditures



NWAC STAFF

- **Mark Moore** – Director and forecaster at the NWAC since 1977. Focal point for budget, avalanche accident information, Web site, computer and weather station management.

- **Kenny Kramer** – Forecaster at the NWAC since 1988. Focal point for AWIPS (Automatic Weather Informatiom Processing system) maps and macros, Resource Advisory Committee proposals.

- **Garth Ferber** – Forecaster at the NWAC since 1993. Focal point for weather station programs and data, forecast products, FOAC Snow pack Information Exchange.