



Snowpack Monitoring, 2007-2008 Annual Summary

Central Alaska Network

Natural Resource Data Series NPS/CAKN/NRDS—2012/243



ON THE COVER

Tokositna Valley SNOTEL site – Installed in CAKN in 2006.

Photograph by: Courtesy of Rick McClure NRCS

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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Abstract

The snowpack for the 2007-2008 varied across the state, from record high snowfalls on the Seward Peninsula and in Southeast Region, to near record lows for the western interior locations. The first persistent snows for the Central Alaska interior fell during the first week of October. Snow courses in the northern areas of Wrangell St. Elias, Yukon-Charley and the eastern portions of Denali had snowpacks that were 50% of normal for most of the season. Some late season storms came through in April and deposited 20% of the annual snowfall in the central interior. These storms originated in the Bering Sea and did not reach the western interior locations or the Copper River Basin.

Acknowledgements

The data and results in this report would not be possible without the help of a number of people. Thanks to Paul Atkinson for doing the snow surveys for Yukon-Charley National Preserve and to Jared Withers for helping with the Denali snow surveys. Many thanks to the park pilots, Colin Milone, Tom Betts, and Rich Richotte, and the contract pilots, Sandy Hamilton, Robert Wing, and Jay Hudson, for flying safely and getting field data during the coldest and darkest time of the year. I also would like to thank Rick McClure, Dan Kenny, and James Montessi from NRCS, who make the surveys and data dissemination seamless.

Introduction

A predominate feature of climate in high latitude regions is the presence of a seasonal snowpack. The snowpack is a major influence on hydrology, vegetation, and faunal communities. A main objective of the Central Alaska Network’s (CAKN) snowpack monitoring program is to record long-term trends in snow by engaging in an interagency agreement with the Natural Resources Conservation Service (NRCS) to survey snow courses, aerial snow markers, and install and maintain recording precipitation gauges (as part of the SNow Telemetry [SNOTEL] network) in all three CAKN parks, including Denali National Park and Preserve (DENA), Wrangell – St. Elias National Park and Preserve (WRST), and Yukon-Charley Rivers National Preserve (YUCH). The SNOTEL sites have proven to be the most accurate instrumented sites to document all forms of precipitation in Alaska, including snowfall which is difficult to measure in remote locations. The agreement between the NPS and NRCS includes data dissemination and archiving. The data provided in this report comes almost exclusively from the NRCS Alaska Snow, Water and Climate Services web based server (NRCS 2008)

Methods

Snow pack is measured in several different ways in the Central Alaska Network. The objective of a snow survey or snow measurement is to determine the snow water equivalent or SWE, which is the amount of water in the snowpack. Snowpack monitoring for the CAKN is done through an interagency agreement with NRCS in Anchorage. For detailed methods refer to the Snowpack Monitoring Protocols for the CAKN (Sousanes 2004). The snow monitoring sites for the CAKN are shown in Figure 1.

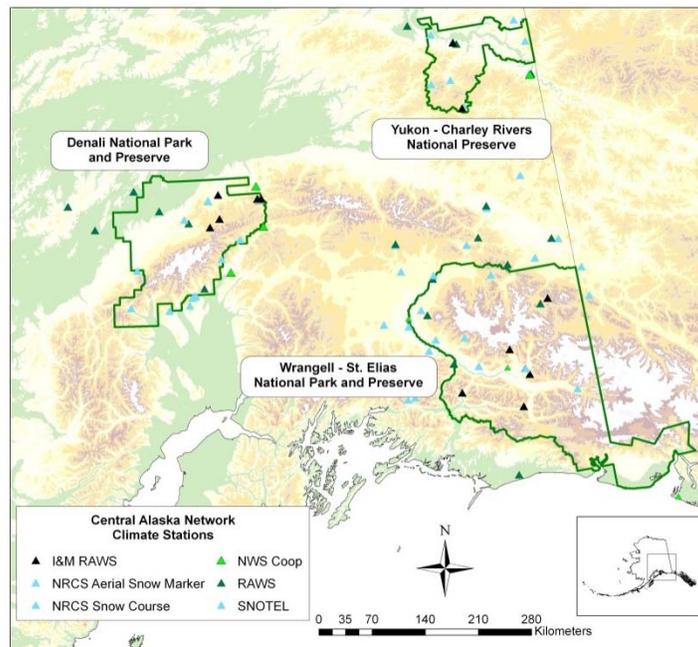


Figure 1. Locations of snow monitoring sites in the Central Alaska Network.

SNOTEL

The most useful information we have on snow pack is from the new CAKN SNOTEL sites at Kantishna and Tokositna Valley in Denali National Park and Preserve and at May Creek in Wrangell – St. Elias National Park and Preserve. SNOTEL sites adjacent to CAKN parks are useful as well, including Mission Creek at Eagle near Yukon-Charley Rivers National Preserve, and the Upper Tsaina SNOTEL south of Copper Center near Wrangell – St. Elias National Park and Preserve. This year we look forward to the data from the new Chisana SNOTEL site in Wrangell – St. Elias installed in July of 2008.

Snow Courses and Aerial Markers

There are 20 snow courses and aerial snow markers in the three CAKN parks (Figure 2). Park staff, including park pilots, and contracted pilots, fly these surveys the last 3 days of each month from November through April. A certain amount of logistic flexibility and cold weather hardiness is necessary to undertake these surveys. Weather and daylight are critical factors in making sure they are done safely.

Snow Depth Sensors

Acoustic snow depth sensors were added to most of the CAKN and Remote Automated Weather Station (RAWS) climate stations that were installed in the past few years. This measurement offers a cumulative look at snowpack development through the season.

Other Networks

The McKinley Park, Eagle, Cantwell, McCarthy, and Yakutat National Weather Service Cooperative Observer sites, or COOP sites, manually record snow depth and precipitation on a daily basis. These sites have records dating back many decades and are valuable for long term trend analysis.



Figure 2 Example of a snow course in Denali National Park and Preserve

Results

Snow surveys in all three CAKN parks were done on Dec 1, Feb 1, March 1, April 1 and May 1. Data from these surveys are available on the NRCS website at <http://www.ak.nrcs.usda.gov/snow/>, the sites specific to the Central Alaska region are compiled in this report. The snow pack for most of the CAKN region early in the season was between 50 and 70% of normal, the exception was the Chugach and Wrangell Mountain Ranges in WRST and the southern flanks of the Alaska Range in DENA where the snow pack was closer to normal. The cold temperatures and persistent snowfalls throughout April brought the snowpack totals for most of the region to at or above normal levels for the end of the season. The exception was the eastern portion of the Alaska Range in the northern areas of WRST which remained below normal for the entire season.

Tanana Basin 2007-2008 Surveys

The Tanana Basin includes the north side of Denali from Park headquarters to Kantishna and the northern areas of Wrangell - St. Elias from the Canadian border to the Nabesna Road. North of the Alaska Range across the interior of Alaska the first measurable snow was recorded in the western part of the basin during the first week of October. In Eagle, the day of the first persistent snow was October 24. The acoustic snow depth sensor at Chisana in WRST recorded the first persistent snow on November 14. The SNOTEL site at Kantishna now provides daily snow depth and precipitation data, so we were able to determine when the season started – on October 1st 1 inch of snow was recorded and snow remained on the ground for the rest of the winter.

In November, Interior Alaska was about 10 degrees warmer than normal and snowfall total was about 60% of normal. On November 30, 9 inches of snow was measured at Kantishna, the same amount as the past two years. The Denali Park headquarters site had 4 inches of snow on November 30th; the long-term average is 10 inches for this date. Jatamund Lake, north of Chisana in WRST, reported 8 inches of snow on November 30 which is 50% of normal, and Lost Creek, on the Nabesna Road, reported 7 inches.

By February the snowpack was getting closer to normal conditions. There were 22 inches of snow on February 1st in Kantishna, which is 78% of normal. The Jatahmund Lake snow course had 14 inches, 87% of normal, and Chisana was 75% of normal with 15 inches on the ground. The middle Tanana Basin was still below normal, with the Rock Creek sites and the headquarters site in Denali at about 50% of normal. The same pattern persisted into March and April; the lower Tanana Basin sites were about 80% of normal, the middle basin remained at 50% of normal, and the western sites were 80-85% of normal. April of 2008 was a snowy month for the interior. At Denali Park headquarters it snowed 10 out of 30 days of the month and was the 4th snowiest April on record with 21 inches of total snowfall. All of the sites in the middle Tanana Valley were above normal for April. See Appendix A for individual site data.

The Kantishna SNOTEL site recorded 6.1 inches of total winter precipitation (snow water equivalent) from October 1, 2007 through May 1, 2008, 29% of the total annual precipitation of 21.4 inches. See Appendix B for snowfall and precipitation accumulation graphs. The McKinley Park NWS total snowfall was 79% of normal for the year (32% of the total fell in April) with an annual total of 63.4 inches of snow for the season, the average snowfall is 80.1 inches. Monthly

totals for November and March were well below average. The Cantwell NWS COOP, located south of the crest of the Alaska Range, lies within the Tanana Basin as well, since Cantwell Creek drains into the Nenana River. This site had record low snowfall amounts in November, February and April. The annual snowfall amount was 91.1 inches, 73 % of normal. See Appendix C for tables and graphs with long-term data. Figure 3 shows the NRCS snow survey report graphs for the area.

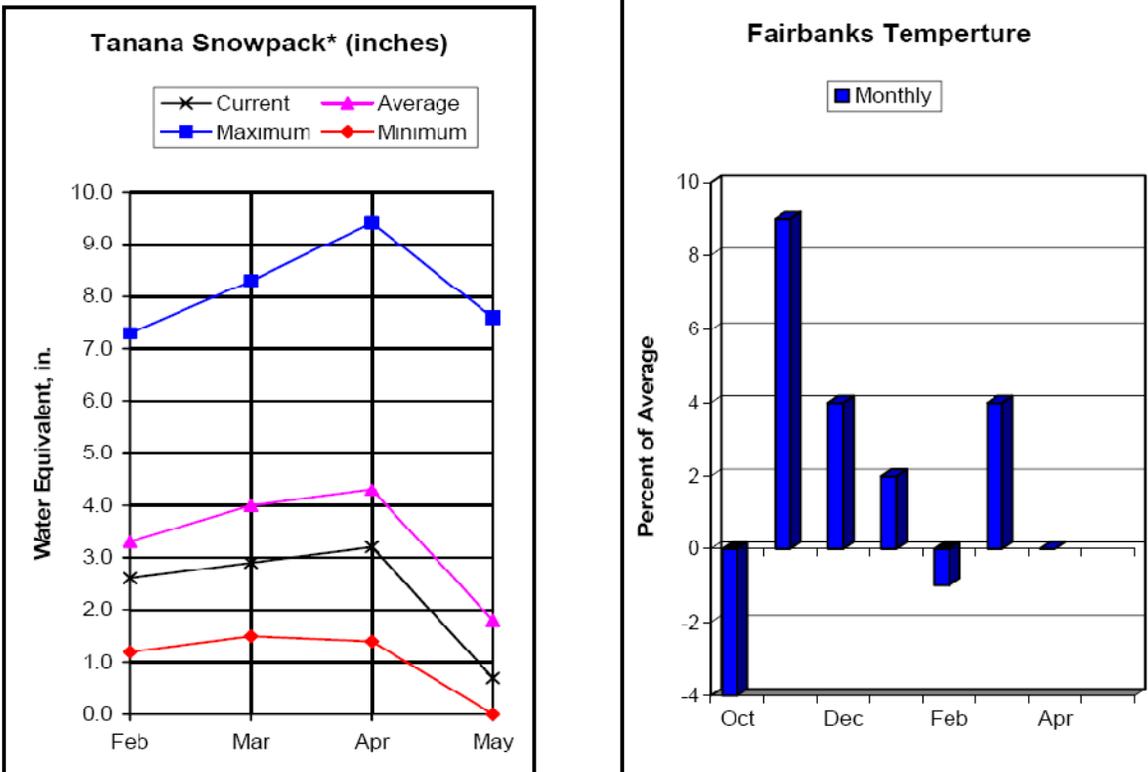


Figure 3. Tanana Basin snow season. Graphs courtesy of the NRCS, Anchorage, AK (NRCS, 2008).

Central Yukon Basin 2007 – 2008 Surveys

The Central Yukon Basin encompasses all of Yukon-Charley Rivers National Preserve (YUCH). This part of the state had a snowpack that was below normal, according to long-term records at Eagle, for the entire season. The sites at YUCH however had consistently more snow throughout the season than Eagle. The Coal Creek climate station reported the first measurable snow on October 3, 2007 with 2 inches of snow. The first measurable snow at Mission Creek in Eagle occurred on October 13, 2007. December measurements of the Yukon-Charley snow markers and Coal Creek snow courses ranged from 3 inches to 9 inches.

By February 1 the snowpack was more substantial at the Coal Creek, Step Mountain, and Three Fingers sites, averaging about 14 inches, than at Copper Creek and Crescent Creek which had 4

inches. The peak March snowpack for the region ranged between 9 and 14 inches in the lower valley sites to 24 inches in the upper Charley River drainage at the Three Fingers site. April 1 was the last snow survey of the season for the Central Yukon sites. Coal Creek was 70% of normal while the Mission Creek site at Eagle remained at 50% of normal. The Upper Charley site had 26 inches on April 1 and the lower sites ranged between 7 inches and 14 inches. The graphs taken from the NRCS Alaska Snow Survey Report for May 1 shows the average of all of the snow courses within the watershed; with temperatures from a nearby long-running climate station (Figure 4).

Mission Creek SNOTEL had a total of 3.1 inches of precipitation between October 1, 2007 and May 1, 2008, the average is 6.0 inches, so the snow water equivalent was about 50 % of normal for the year. The mean annual total precipitation for this site is 13.6 inches and was 14.6 for 2008, an inch above normal. The data are downloaded manually at this site and September 8, 2008 was the last site visit. See Appendix B for water year charts for the Mission Creek SNOTEL. The Eagle NWS COOP site recorded an annual snowfall amount of 37.8 inches or 63% of the normal 60 inches. See Appendix C for tables and graphs with long-term data.

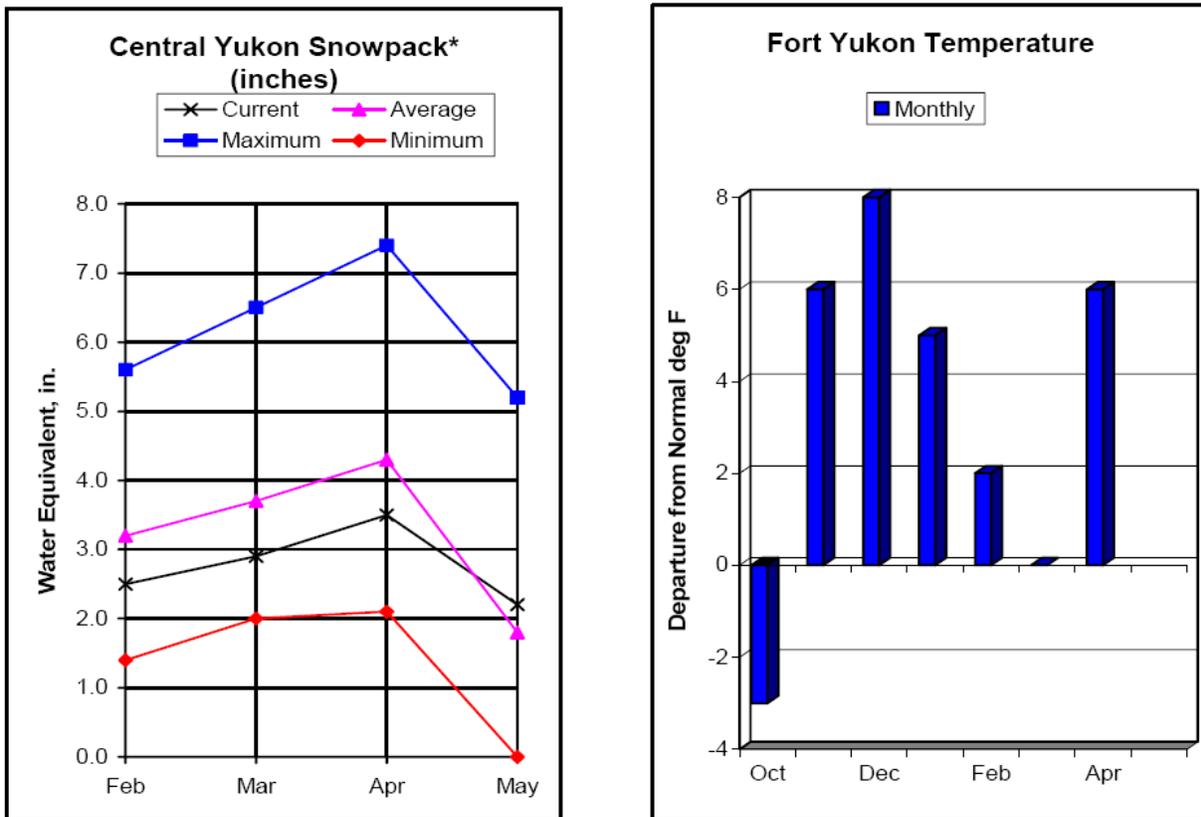


Figure 4. Central Yukon Basin snow season. Courtesy of NRCS, Anchorage, AK (NRCS, 2008).

Western Interior Basin (Formerly called Lower Yukon –Upper Kuskokwim) 2007-2008 Surveys

Lake Minchumina and Purkeypile in Denali, are the two sites within the CAKN that are included in this hydrological division. This region was near normal for the year with snow depths at Lake Minchumina at 19 inches for March and April, which is 90% of normal. Although surveys were not flown for the May 1 survey it is estimated that the snow course ended up with a snowpack well above average for this month, based on snowfall at surrounding stations. Figure 5 shows the NRCS snow survey report graphs for the area.

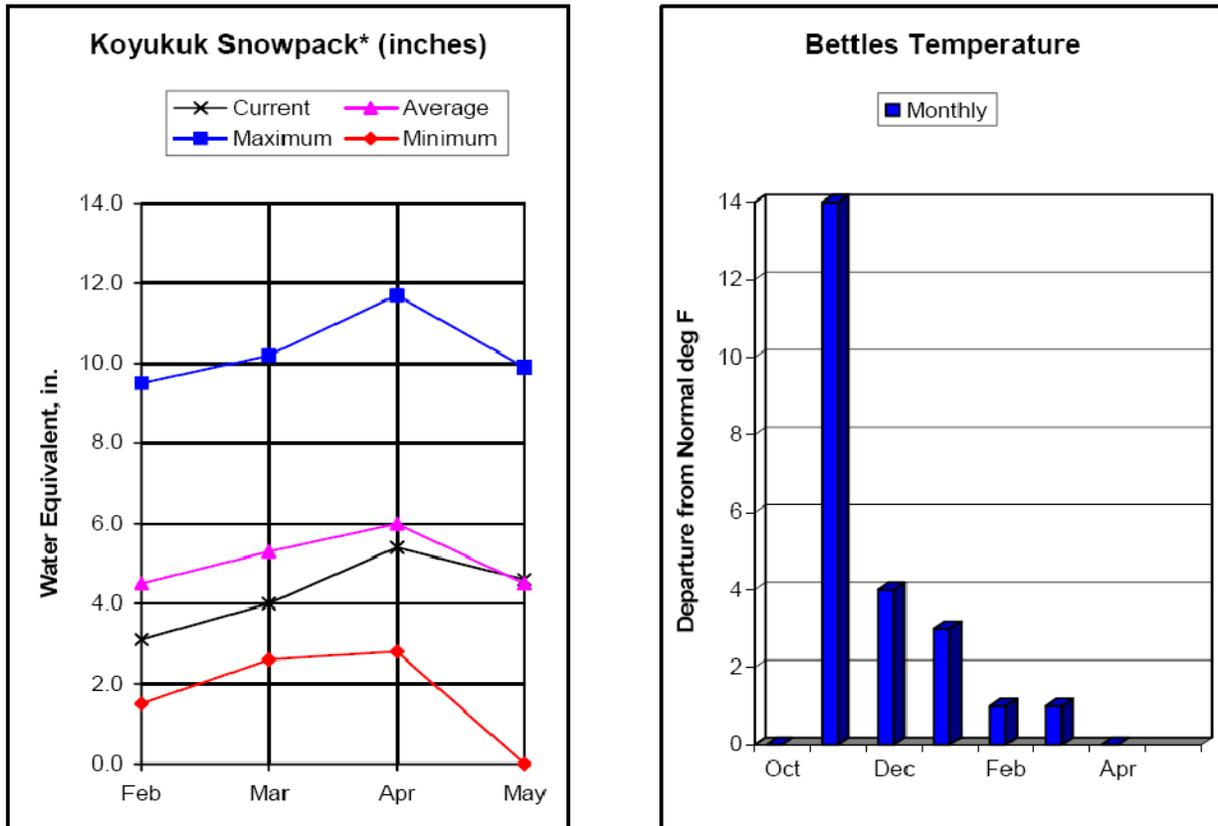


Figure 5. Koyukuk Basin snow season. Courtesy of NRCS, Anchorage, AK

Copper Basin 2007- 2008 Surveys

The Copper Basin is divided into 3 regions: the Chugach Range, the Basin Floor and the Wrangell Mountains. The data from the early season surveys showed the Basin Floor at 64% of normal, the Chugach Range at 75% of normal, and the Wrangell Mountains at 72% of normal. The new May Creek SNOTEL showed snow on the ground starting on October 24 with 1 inch of snow. By the March 1 surveys the snow courses in the Chugach Range had received more snow and were at 83% of normal, the Wrangell Range courses were at 74% of normal, while the Basin Floor snowpack had very little additional accumulation and dropped to 54 % of normal (NRCS, 2008). The peak snow depths were recorded around the April 1 surveys at all sites except the Chugach site which peaked a bit earlier. Late season snows affected the Wrangell Mountains

more than the Chugach; the Tebay site and the Tana Knob site (in the Chugach Range) did not show the increasing trend that the Gates Glacier site (in the Wrangell Mountains) showed. The surveys were not flown in WRST this month due to weather, but other snow courses in the area and the SNOTEL at May Creek reported lingering snowpacks, most likely attributed to the late April snowfalls. Figure 6 shows the NRCS snow survey report graphs for the area.

The new SNOTEL site at May Creek reported its first full year of precipitation, snow water equivalent, and cumulative precipitation. There was 6.8 inches of snow water equivalent on May 1st; the annual total precipitation was 18.3 inches, so the winter snowfall accounted for 37% of the total precipitation for the year. The snow off date was May 2, 2008; two days before this there had been 6 inches of snow on the ground, so the melt period was short. The McCarthy NWS COOP site has daily snowfall going back 13 years. There was 55.9 inches of total snowfall for the 2007-08 season; the mean after 12 years is 64.6 inches. The highest monthly snowfalls were in November and April. See Appendix C for McCarthy snowfall data.

I will include the data from Yakutat in this section. It does not fall within the Copper Basin, but it does describe the coastal southeast area of WRST. There are no snow courses in this area, but the NWS Yakutat COOP station records snowfall. The site reported a total of 162.3 inches of snow for the year, or 87% of the 187 inches the site normally receives. There was a meager total of 1.1 inches of snow recorded for November of 2007, and the normal is 21.1 inches. This is most likely due to the warmer than normal temperatures experienced statewide, with any precipitation in the coastal areas most likely falling as rain rather than snow. See Appendix C for graphs related to the Yakutat site.

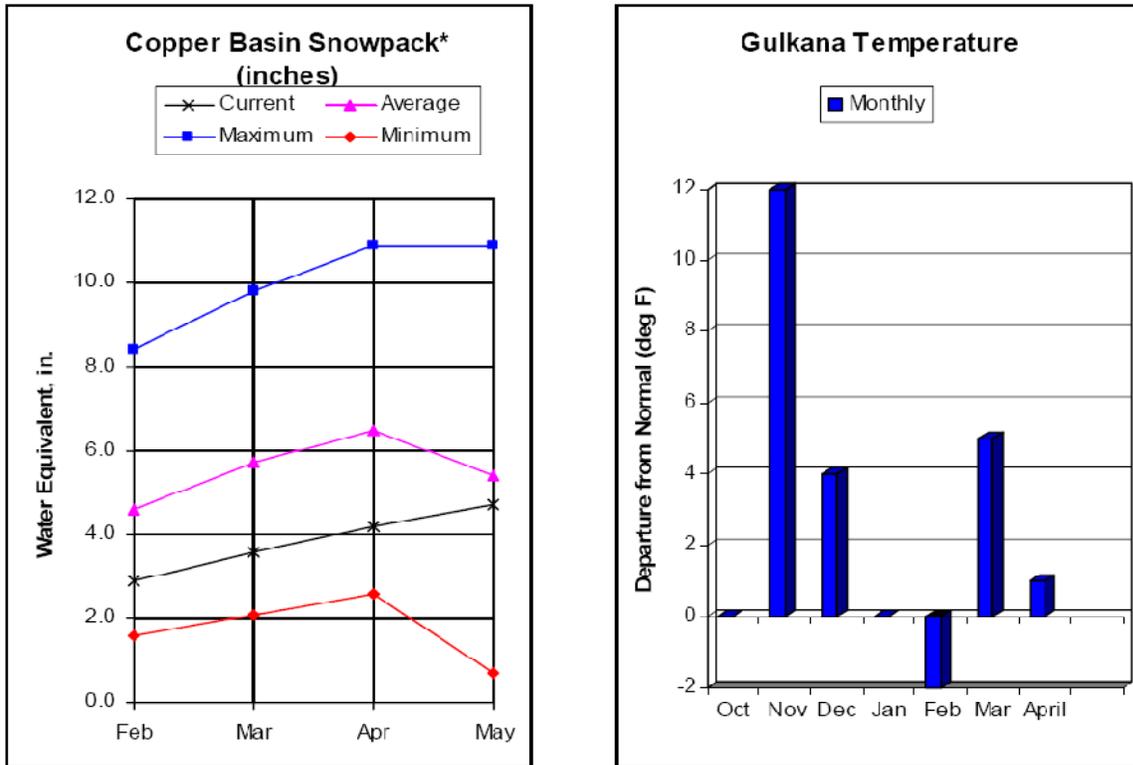


Figure 6. Copper Basin snow season. Courtesy of NRCS, Anchorage, AK

Matanuska – Susitna Basin 2007-2008 Surveys

The new CAKN Tokositna Valley SNOTEL site now provides daily measurements of precipitation and snow. The first measurable snow that persisted was on October 14, 2007. The early season measurements for the markers that were in the western part of the Susitna Valley were near normal with some slightly above normal. The storm tracks for the season mostly came from the southwest and lost momentum by the time they reached the Parks Highway. There was little additional accumulation for January and February, and the March 1 surveys indicated a snowpack about 89% of normal. The near normal conditions persisted through March. The April snowfall was higher than normal in this area as well, so unlike normal years where the snowpack peaks in March and starts to decrease through April, it continued to accumulate through the end of the survey period. The snowpack for the area was at 110% of normal for the May 1 survey. Figure 7 shows the NRCS snow survey report graphs for the area.

The precipitation gage at Tokositna Valley recorded 22.2 inches of precipitation from October 1, 2007 through May 1, 2008, which is only 0.5 inches different than last year's total and one tenth shy of the 1971-2000 normal. See Appendix B for more information on the Tokositna SNOTEL data.

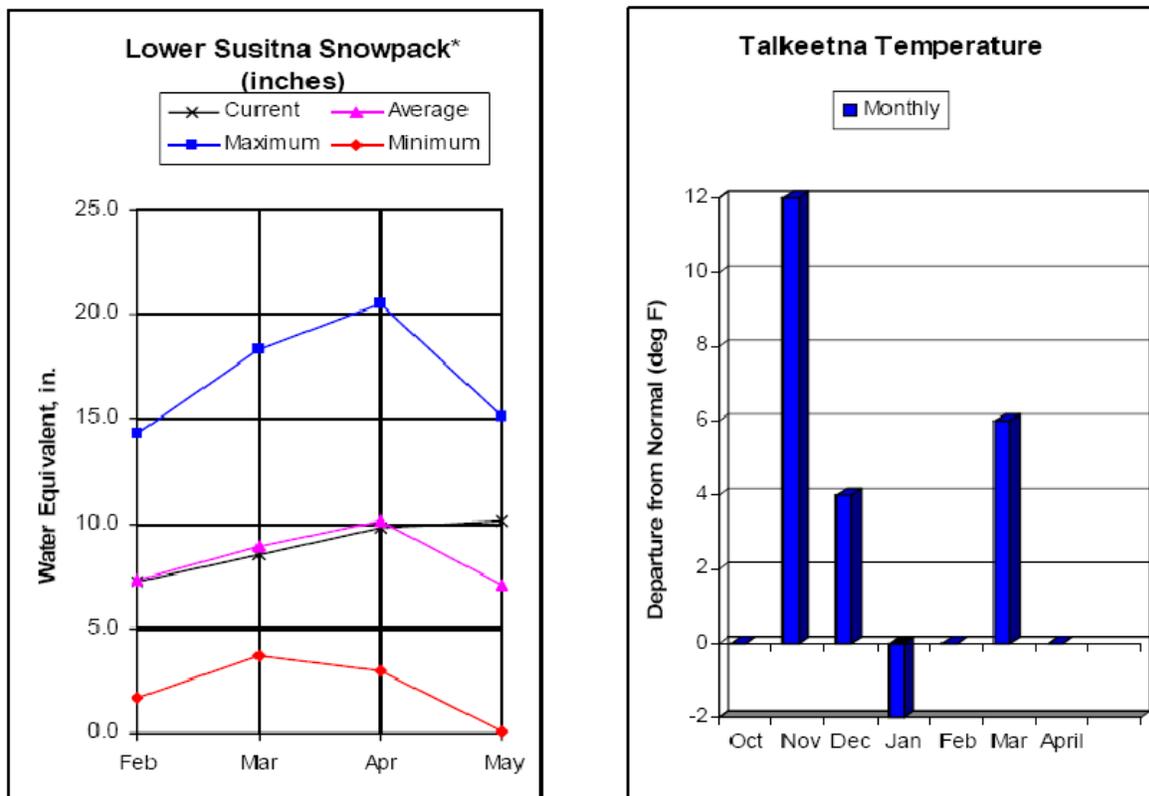


Figure 7. Lower Susitna Basin snow season. Courtesy of NRCS, Anchorage, AK

Discussion

The snowpack across the Central Alaska Network varied quite a bit, mainly because the network encompasses over 21 million acres and includes north and south aspects of four major mountain ranges. Within the major ecoregions there were consistent patterns, as one might expect. In interior Alaska, the “snow –on” date, or the date in the fall which marks the 1st day of the lasting seasonal snowpack, was consistent among most sites in the network, occurring around the first week of October. In general, the snowpack in interior Alaska was 50 to 60% below normal for the season, while the eastern border and the north Gulf Coast received either average or above average amounts of snow. The upper Susitna Valley on the south side of Denali and the western regions of Denali were at normal or slightly above.

The temperature departure from normal for the region varied from north to south more than east to west. Most of the northern sites recorded warmer than normal temperatures for the entire winter season, while the sites in the Copper River Basin and the central interior below 64° latitude were cooler than normal for January, February and April. In November and December all of the sites in the region had strong positive departures from temperature normals, ranging between 4 and 16 degrees warmer than normal. The storms that brought the most snow originated from the southwest and decreased in strength as they approached the middle of the state. There were some storm tracks that originated from the Gulf of Alaska and these storms

tended to track up along the eastern boundary of the state, leaving the central interior with lower than normal snowpacks; the same patterns occurred in 2006-2007.

The Yukon-Charley area had consistently more snow than Eagle over the entire season, but we don't have long term records to compare how this year measured up to normal. Eagle was about 50% of normal, but the Coal Creek site had more than twice as much snow each month than Eagle recorded. The Upper Susitna Basin was near normal and received most of the snow from storms moving southwest to southeast. The southeast panhandle was above normal for the second year in a row, but the area around Yakutat was only at 85% of normal, the same as the Chugach and Wrangell Ranges. The NRCS publishes Alaska snowpack maps for each month the snow surveys are done starting on Feb 1. These maps give a nice overall picture of snowpack variability around the state (See Appendix E).

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Appendix A. Snow Course Data from 2008

Snow Course Data	2008								
SNOW COURSE	ELEV.	FEB		MAR		APR		May	
Name	ft.	depth	swe	depth	swe	depth	swe	depth	swe
		in.	in.	in.	in.	in.	in.	in.	in.
Talkeetna	350	26	4	25	6	24	7	***	***
Tokositna Valley	850	61	14	66	15	68	19	58	20
Chelatna Lake	1450	46	11	45	12	48	14	47	16
Nugget Bench	2010	46	11	43	12	50	15	53	18
Ramsdyke Creek	22200	64	17	65	18	69	23	69	24
Dutch Hills	3100	67	19	66	21	80	27	80	29
Fairbanks Field Off.	450	***	***	16	3	14	3	***	***
Lake Minchumina	730	***	***	19	3	19	4	10	3
Kantishna	1550	***	***	22	4	22	4	***	***
Jatahmund Lake	2180	14	2	14	2	13	3	2	0.2
Rock Creek Bottom	2250	12	2	15	2	12	2	9	3
Rock Creek Ridge	2600	12	2	14	2	12	2	13	3
Lost Creek	3030	***	***	16	2	16	3	16	4
Chisana	3320	15	3	18	3	18	4	***	***
Purkeypile Mine	2025	***	***	14	3	***	***	***	***
Valdez	50	35	9	38	11	46	16	36	13
Tazlina	1225	12	1	16	2	11	3	0	0
Kenny Lake School	1300	10	1	12	2	10	3	0	0
Chokosna	1550	13	2	14	3	11	3	***	***
May Creek	1610	21	3	24	4	27	5	6	1
Tsaina River	1750	40	9	48	12	53	15	40	14
Chistochina	1950	19	2	20	4	17	3	***	***
Tolsona Creek	2000	14	1.7	17	3	15	3	***	***
Dadina Lake	2160	20	3	21	3	21	4	***	***
Sanford River	2280	15	2	24	4	26	5	***	***
Mission Creek	900	11	2	11	2	9	2	***	***
Coal Creek	1000	12	2	14	2	16	3	***	***

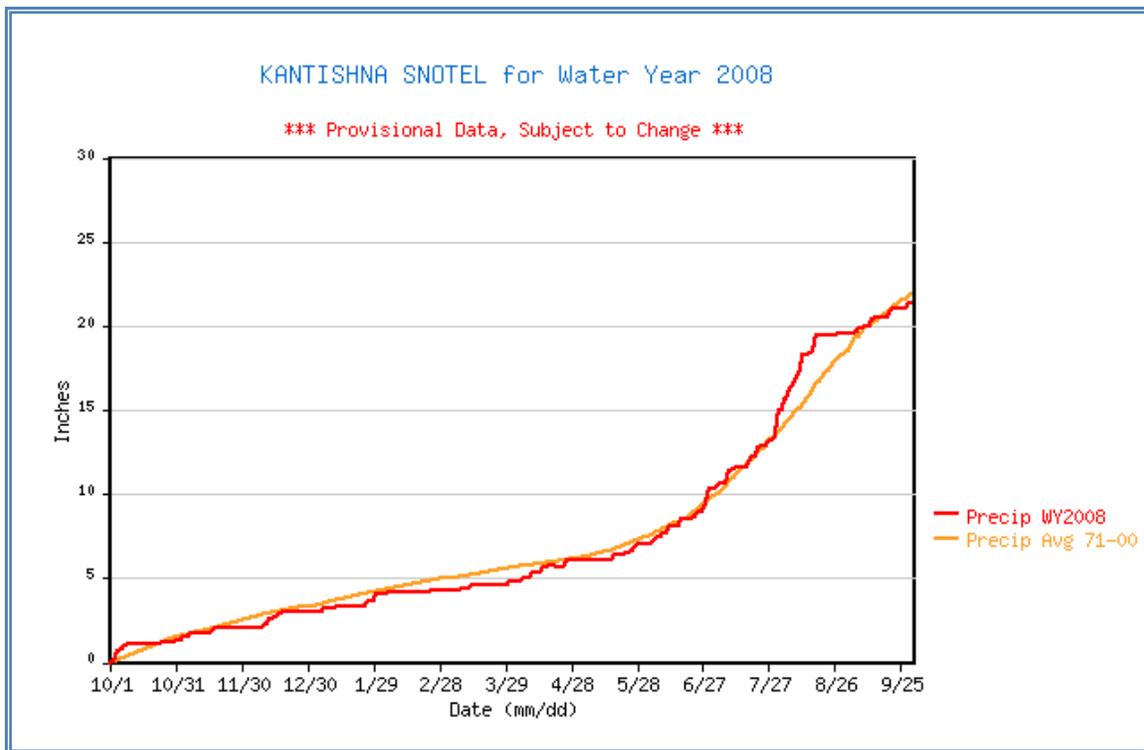
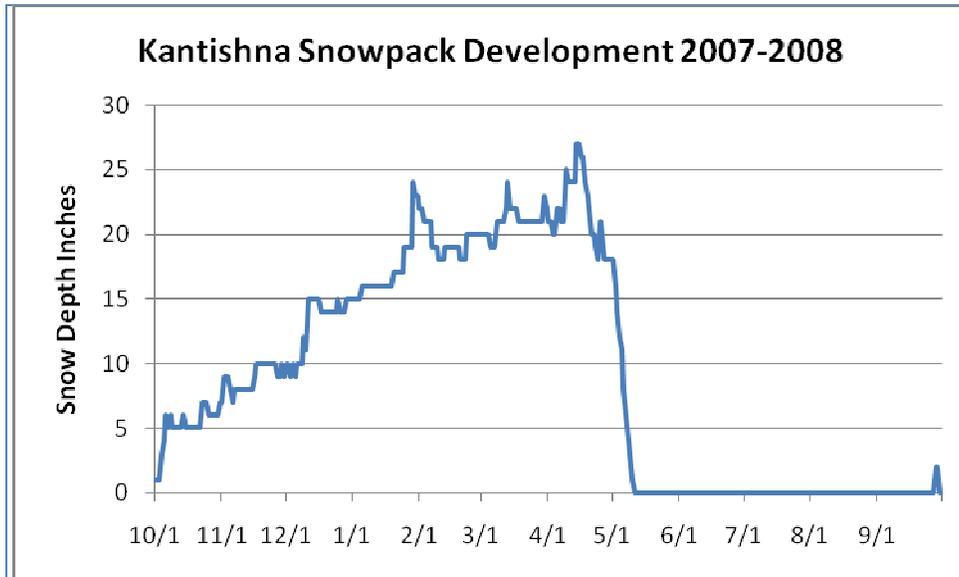
Snow Course Averages 1971-2001

Snow Course Averages	1971-2000								
SNOW COURSE	ELEV.	FEB		MAR		APR		May	
Name	ft.	depth	swe	depth	swe	depth	swe	depth	swe
		in.	in.	in.	in.	in.	in.	in.	in.
Matunuska Susitna basin									
Talkeetna	350	28	6.2	32	7.6	34	8.7	16	5.4
Tokositna Valley	850	55	13.6	67	15.7	62	18.7	43	17
Chelatna Lake	1450	36	8.3	42	10	44	11.6	33	10.9
Nugget Bench	2010	45	10.9	51	12.9	55	15.5	46	15.3
Ramsdyke Creek	2220	61	16.3	66	18.9	69	22	57	21.9
Dutch Hills	3100	69	19.6	76	23	80	27.5	74	28.7
Fairbanks Field Off.	450	21	3.5	23	4.1	23	4.5	3	0.8
Lake Minchumina	730	19	3.2	21	4	21	4.4	5	1.3
Kantishna	1550	26	4.5	28	5.3	30	5.7	15	3.1
Jatahmund Lake	2180	16	2.3	18	2.9	18	3.2	***	***
Rock Creek Bottom	2250	20	3.7	22	4.2	22	4.3	8	2.2
Rock Creek Ridge	2600	24	4.3	26	4.9	26	5.3	14	4.9
Lost Creek	3030	25	4.8	26	4.8	21	4.2	***	***
Chisana	3320			22	3.4	22	3.6	***	***
Purkeypile Mine	2025	20	3.9	21	4.2	21	4.1	10	2.5
Valdez	50	45	11.9	51	15.5	54	17.8	33	12.6
Tazlina	1225	17	3	20	3.7	19	4.2	***	***
Kenny Lake School	1300	14	2.6	18	3.4	17	3.7	3	0.9
Chokosna	1550	***	***	21	3.2	22	3.9	***	***
May Creek	1610	***	***	21	3.8	21	4.5	***	***
Tsaina River	1650	50	12.5	56	15.7	57	17.6	41	14.6
Chistochina	1950	18	3	22	3.5	22	4.1	4	1.2
Tolsona Creek	2000	19	3.2	22	3.8	22	4.1	5	2.1
Dadina Lake	2160	24	4.1	29	5.1	27	5.9	***	***
Sanford River	2280	24	4.2	28	5.4	28	6.2	15	4
Mission Creek	900	15	3.1	18	3.6	18	4.1	2	0.5
Upper Chena	3000	28	6.2	30	6.9	33	7.8	25	7.5

Appendix B. SNOTEL Site Data

These data are available courtesy of the NRCS and are can be accessed at <http://www.ambcs.org/dbArchive.html>

Kantishna – North Side Denali National Park and Preserve

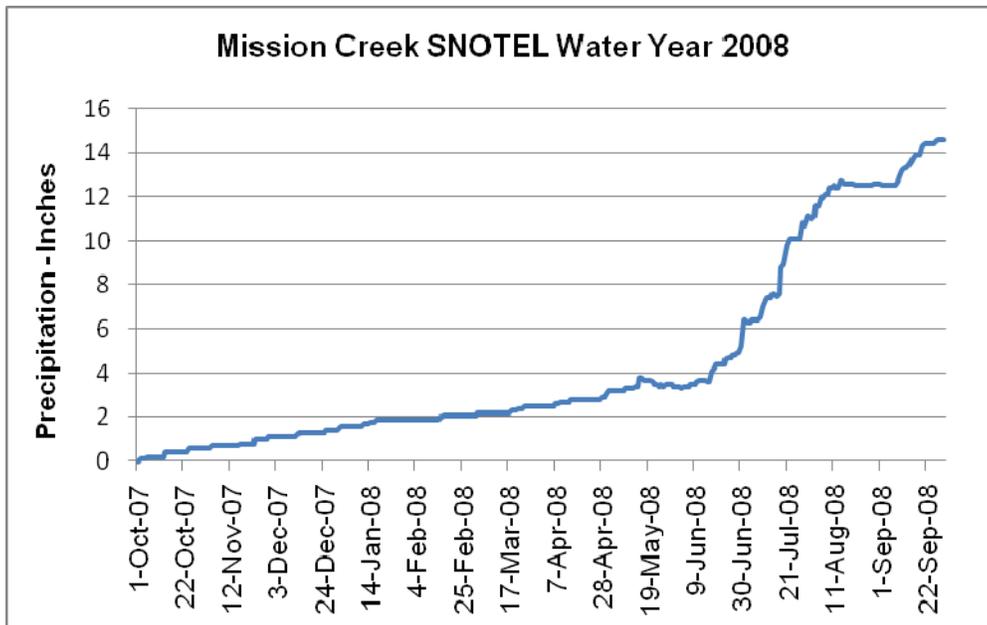
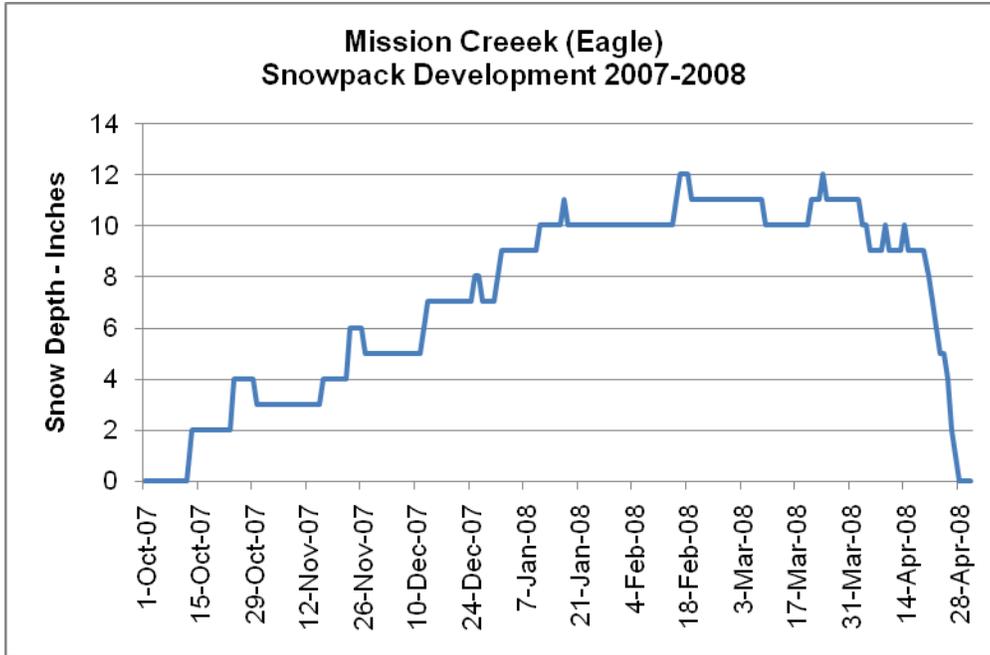


Daily precipitation totals for Kantishna for 2007-2008 season Oct 1 – Sep 30.

Unit = inches

day	oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep
1	0.0	1.3	2.1	3.0	4.1	4.3	4.8	6.1	7.1	10.4	15.0	19.6
2	0.1	1.3	2.1	3.0	4.1	4.3	4.8	6.1	7.1	10.4	15.0	19.6
3	0.4	1.5	2.1	3.0	4.1	4.3	4.8	6.1	7.1	10.5	15.7	19.6
4	0.7	1.5	2.1	3.0	4.1	4.3	4.8	6.1	7.2	10.6	15.7	19.6
5	0.7	1.5	2.1	3.0	4.2	4.3	4.8	6.1	7.3	10.7	16.0	19.7
6	0.8	1.8	2.1	3.2	4.2	4.3	5.0	6.1	7.5	10.7	16.4	19.9
7	1.0	1.8	2.1	3.2	4.2	4.3	5.0	6.1	7.5	10.7	16.5	19.9
8	1.0	1.8	2.1	3.2	4.2	4.3	5.0	6.1	7.5	11.0	16.8	19.9
9	1.1	1.8	2.1	3.2	4.2	4.4	5.0	6.1	7.7	11.4	17.1	20.0
10	1.1	1.8	2.3	3.2	4.2	4.4	5.4	6.1	7.7	11.4	17.4	20.0
11	1.1	1.8	2.3	3.2	4.2	4.4	5.4	6.1	7.9	11.5	18.4	20.1
12	1.1	1.8	2.6	3.3	4.2	4.4	5.4	6.1	8.1	11.6	18.4	20.5
13	1.1	1.8	2.6	3.3	4.2	4.5	5.4	6.1	8.1	11.6	18.4	20.5
14	1.1	1.8	2.6	3.3	4.2	4.6	5.4	6.1	8.1	11.7	18.4	20.6
15	1.1	1.8	2.7	3.3	4.2	4.6	5.7	6.1	8.1	11.7	18.5	20.6
16	1.1	1.9	2.8	3.3	4.2	4.6	5.7	6.1	8.1	11.7	18.6	20.6
17	1.1	2.0	2.9	3.3	4.2	4.6	5.7	6.2	8.6	11.7	19.1	20.6
18	1.1	2.1	2.9	3.3	4.2	4.6	5.8	6.4	8.6	12.0	19.5	20.6
19	1.1	2.1	3.0	3.3	4.2	4.6	5.8	6.4	8.6	12.3	19.5	20.6
20	1.1	2.1	3.0	3.3	4.2	4.6	5.8	6.4	8.6	12.3	19.5	20.8
21	1.1	2.1	3.0	3.4	4.2	4.6	5.7	6.4	8.6	12.3	19.5	21.0
22	1.1	2.1	3.0	3.4	4.2	4.6	5.7	6.4	8.6	12.8	19.5	21.1
23	1.1	2.1	3.0	3.4	4.2	4.6	5.7	6.5	8.7	12.8	19.5	21.1
24	1.2	2.1	3.0	3.4	4.3	4.6	5.7	6.5	8.9	12.9	19.5	21.1
25	1.2	2.1	3.0	3.4	4.3	4.6	5.8	6.7	9.0	12.9	19.5	21.1
26	1.2	2.1	3.0	3.6	4.3	4.6	6.1	6.7	9.0	12.9	19.5	21.1
27	1.2	2.1	3.0	3.7	4.3	4.6	6.1	6.9	9.0	13.1	19.5	21.1
28	1.2	2.1	3.0	3.7	4.3	4.6	6.1	7.1	9.5	13.2	19.6	21.2
29	1.2	2.1	3.0	3.7	4.3	4.6	6.1	7.1	10.1	13.4	19.6	21.4
30	1.2	2.1	3.0	4.1	---	4.6	6.1	7.1	10.4	13.5	19.6	21.4
31	1.3	---	3.0	4.1	---	4.8	---	7.1	---	14.5	19.6	---
mean	1.0	1.9	2.6	3.3	4.2	4.5	5.5	6.4	8.3	11.9	18.2	20.5
max	1.3	2.1	3.0	4.1	4.3	4.8	6.1	7.1	10.4	14.5	19.6	21.4
min	0.0	1.3	2.1	3.0	4.1	4.3	4.8	6.1	7.1	10.4	15.0	19.6

Mission Creek (Eagle) – Yukon-Charley Rivers Preserve

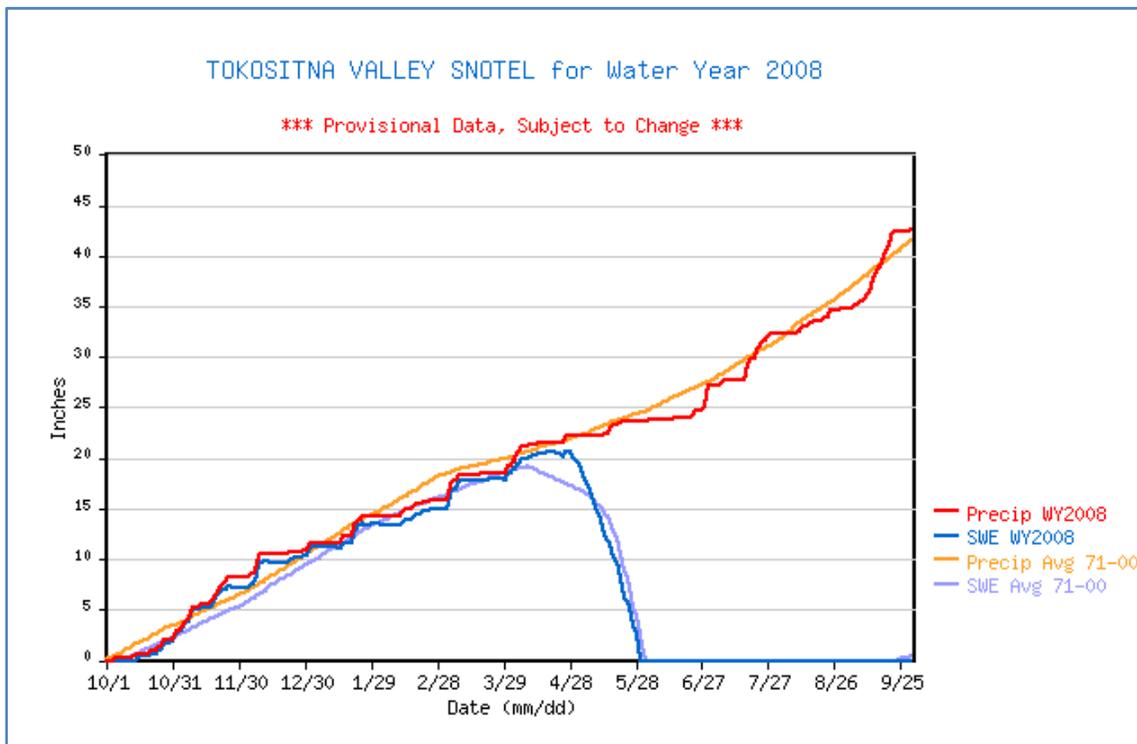
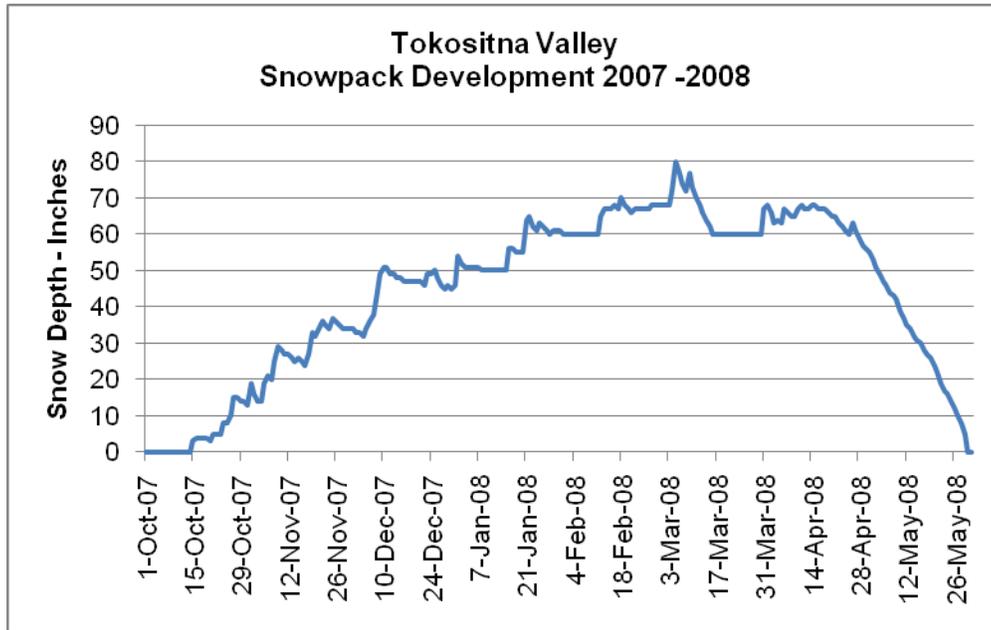


Daily precipitation totals for Mission Creek for 2007-2008 season Oct 1 – Sep 30.

Unit = inches

day	oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep
---	---	---	---	---	---	---	---	---	---	---	---	---
1	0.0	1.6	2.4	3.4	4.7	4.7	5.2	5.5	6.3	6.8	7.9	12.0
2	0.0	1.6	2.4	3.5	4.7	4.7	5.2	5.5	6.3	6.8	7.9	12.0
3	0.0	1.6	2.5	3.5	4.7	4.7	5.2	5.5	6.3	6.8	8.0	12.0
4	0.2	1.6	2.5	3.5	4.7	4.7	5.2	5.6	6.3	6.8	8.6	12.0
5	0.2	1.7	2.5	3.5	4.7	4.7	5.2	5.6	6.3	6.8	8.8	12.0
6	0.2	1.7	2.5	3.6	4.7	4.7	5.2	5.7	6.3	6.8	9.1	12.0
7	0.2	1.7	2.5	3.6	4.7	4.8	5.2	5.7	6.4	6.8	9.4	12.1
8	0.2	1.7	2.5	3.6	4.7	4.8	5.2	5.8	6.4	6.8	9.4	12.1
9	0.2	1.7	2.6	3.6	4.7	4.8	5.2	5.8	6.4	6.8	9.4	12.3
10	0.2	1.7	2.6	3.7	4.7	4.8	5.2	5.8	6.4	6.8	9.4	12.4
11	0.2	1.7	2.6	3.7	4.7	4.8	5.2	6.0	6.4	6.9	9.4	12.4
12	0.3	1.7	2.6	3.8	4.7	4.9	5.2	6.1	6.4	6.9	9.4	12.4
13	0.4	1.7	2.6	3.8	4.7	4.9	5.2	6.1	6.5	6.9	10.6	12.7
14	0.4	1.7	2.6	3.8	4.7	4.9	5.2	6.1	6.5	7.0	10.8	12.7
15	0.4	1.8	2.6	4.0	4.7	4.9	5.2	6.1	6.5	7.0	10.9	13.2
16	0.4	1.8	2.7	4.0	4.7	4.9	5.2	6.2	6.5	7.0	11.0	13.5
17	0.4	1.8	2.7	4.1	4.7	4.9	5.2	6.2	6.5	7.1	11.0	13.5
18	0.4	1.8	2.8	4.2	4.7	4.9	5.2	6.2	6.5	7.1	11.6	13.5
19	0.4	1.9	2.8	4.2	4.7	4.9	5.2	6.2	6.5	7.1	11.7	13.7
20	0.4	2.0	2.8	4.2	4.7	5.0	5.2	6.2	6.5	7.1	11.7	13.8
21	1.1	2.0	2.8	4.3	4.7	5.0	5.2	6.2	6.5	7.1	11.7	14.0
22	1.2	2.0	2.8	4.3	4.7	5.1	5.2	6.2	6.6	7.2	11.7	14.1
23	1.2	2.0	2.8	4.3	4.7	5.1	5.2	6.2	6.6	7.3	11.7	14.1
24	1.2	2.0	2.8	4.4	4.7	5.2	5.5	6.2	6.6	7.4	11.8	14.1
25	1.4	2.1	2.9	4.5	4.7	5.2	5.5	6.2	6.7	7.4	11.8	14.1
26	1.5	2.2	2.9	4.6	4.7	5.2	5.5	6.2	6.8	7.4	11.8	14.1
27	1.5	2.3	3.0	4.7	4.7	5.2	5.5	6.2	6.8	7.4	11.8	14.1
28	1.5	2.3	3.0	4.7	4.7	5.2	5.5	6.2	6.8	7.4	11.8	14.1
29	1.5	2.4	3.2	4.7	---	5.2	5.5	6.2	6.8	7.4	11.9	14.1
30	1.6	2.4	3.3	4.7	---	5.2	5.5	6.2	6.8	7.4	12.0	14.1
31	1.6	---	3.3	4.7	---	5.2	---	6.2	---	7.6	12.0	---
mean	0.7	1.9	2.7	4.0	4.7	4.9	5.3	6.0	6.5	7.1	10.5	13.1
max	1.6	2.4	3.3	4.7	4.7	5.2	5.5	6.2	6.8	7.6	12.0	14.1
min	0.0	1.6	2.4	3.4	4.7	4.7	5.2	5.5	6.3	6.8	7.9	12.0

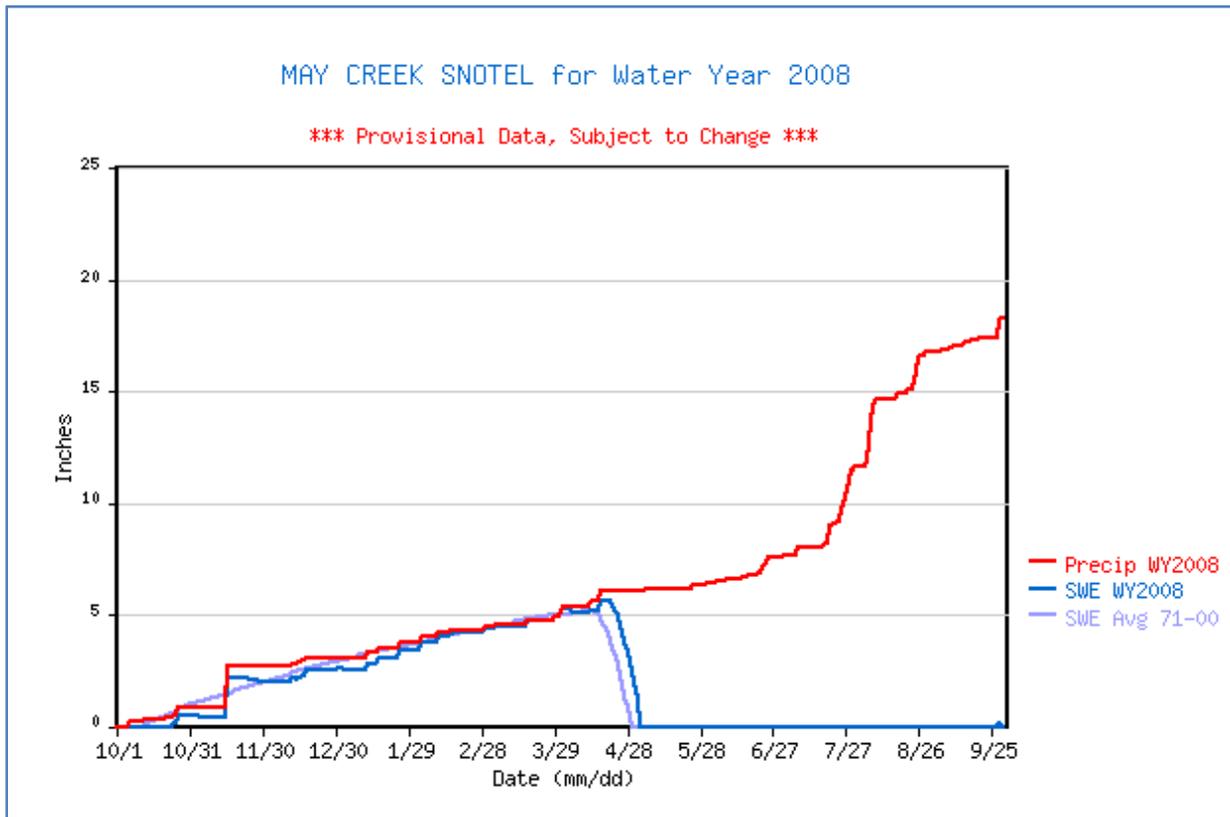
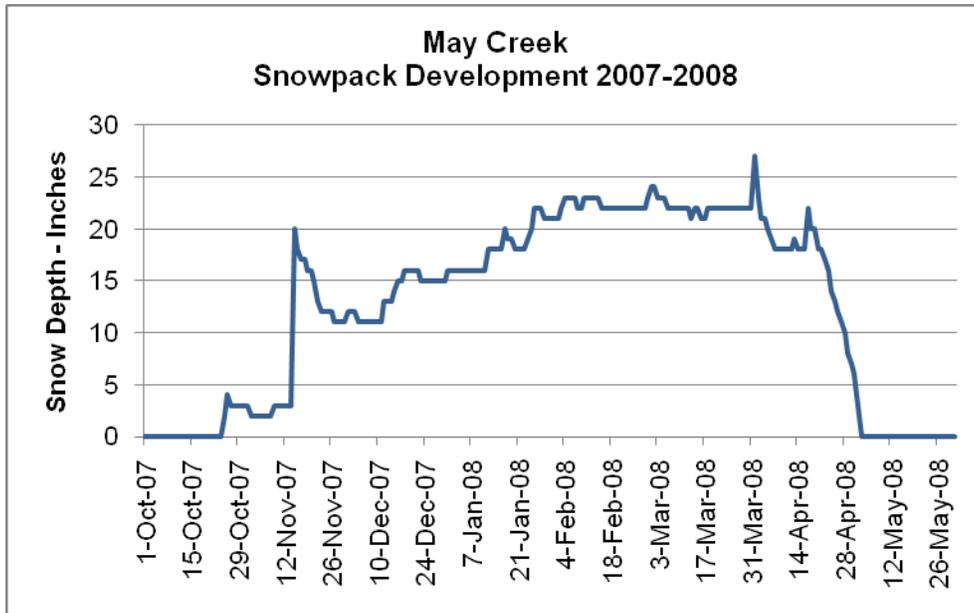
Tokositna Valley – South side of Denali National Park and Preserve



Daily precipitation totals for Tokositna Valley for 2007-2008 season Oct 1 – Sep 30.
 Unit = inches

day	oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep
---	---	---	---	---	---	---	---	---	---	---	---	---
1	0.0	3.0	8.2	11.7	14.3	15.9	19.3	22.2	23.7	27.2	32.3	34.9
2	0.0	3.0	8.2	11.7	14.3	15.9	19.8	22.2	23.7	27.2	32.3	34.9
3	0.0	3.0	8.2	11.7	14.3	15.9	19.8	22.2	23.8	27.2	32.3	34.9
4	0.1	3.2	8.2	11.7	14.3	16.2	20.4	22.2	23.8	27.2	32.3	35.1
5	0.2	3.8	8.4	11.7	14.3	17.5	20.6	22.2	23.8	27.2	32.4	35.2
6	0.3	4.0	8.6	11.7	14.3	17.8	21.1	22.2	23.8	27.5	32.4	35.4
7	0.3	4.1	8.8	11.7	14.3	17.9	21.1	22.2	23.8	27.7	32.4	35.5
8	0.3	4.7	9.4	11.7	14.3	18.0	21.1	22.2	23.8	27.8	32.4	35.6
9	0.3	5.2	10.4	11.7	14.3	18.4	21.1	22.2	23.8	27.8	32.4	35.7
10	0.3	5.3	10.5	11.7	14.3	18.4	21.3	22.2	23.8	27.8	32.6	36.3
11	0.3	5.3	10.6	11.7	14.3	18.4	21.3	22.2	23.8	27.8	32.9	36.4
12	0.3	5.4	10.6	11.7	14.6	18.4	21.3	22.3	23.8	27.8	33.1	37.0
13	0.4	5.5	10.6	11.7	14.8	18.4	21.3	22.3	23.8	27.8	33.1	37.9
14	0.4	5.5	10.6	11.7	14.9	18.4	21.5	22.4	23.9	27.8	33.1	38.3
15	0.7	5.5	10.6	11.8	14.9	18.4	21.5	22.5	24.0	27.8	33.4	38.9
16	0.7	5.6	10.6	12.3	15.0	18.4	21.5	22.9	24.0	27.8	33.4	39.0
17	0.7	5.7	10.6	12.3	15.1	18.4	21.5	23.2	24.0	28.2	33.6	39.5
18	0.7	6.1	10.6	12.3	15.5	18.4	21.6	23.3	24.0	29.3	33.6	40.6
19	0.7	6.5	10.6	12.3	15.5	18.5	21.6	23.4	24.0	29.8	33.6	40.7
20	0.8	6.6	10.6	12.3	15.5	18.5	21.6	23.5	24.0	29.9	33.6	41.1
21	1.0	7.1	10.6	13.2	15.5	18.5	21.6	23.5	24.0	29.9	33.7	42.0
22	1.0	7.3	10.6	13.6	15.7	18.5	21.6	23.6	24.1	30.6	34.0	42.3
23	1.0	7.7	10.7	14.0	15.7	18.6	21.6	23.6	24.4	30.9	34.0	42.4
24	1.3	7.9	10.8	14.0	15.7	18.6	21.6	23.6	24.7	31.5	34.6	42.5
25	1.3	8.2	10.8	14.2	15.8	18.6	21.6	23.6	24.8	31.6	34.6	42.5
26	1.5	8.2	10.8	14.2	15.8	18.6	22.1	23.7	24.8	31.6	34.6	42.5
27	2.0	8.2	10.8	14.2	15.9	18.6	22.2	23.7	24.8	32.0	34.7	42.5
28	2.0	8.2	10.8	14.2	15.9	18.6	22.2	23.7	25.1	32.3	34.7	42.5
29	2.0	8.2	10.9	14.3	15.9	18.6	22.2	23.7	26.3	32.3	34.8	42.5
30	2.1	8.2	10.9	14.3	---	18.6	22.2	23.7	27.2	32.3	34.9	42.6
31	2.1	---	10.9	14.3	---	19.3	---	23.7	---	32.3	34.9	---
mean	0.8	5.9	10.1	12.6	15.0	18.1	21.3	22.9	24.2	29.2	33.4	38.9
max	2.1	8.2	10.9	14.3	15.9	19.3	22.2	23.7	27.2	32.3	34.9	42.6
min	0.0	3.0	8.2	11.7	14.3	15.9	19.3	22.2	23.7	27.2	32.3	34.9

May Creek SNOTEL - Wrangell - St. Elias National Park and Preserve



Station : AK42M01S, MAY CREEK

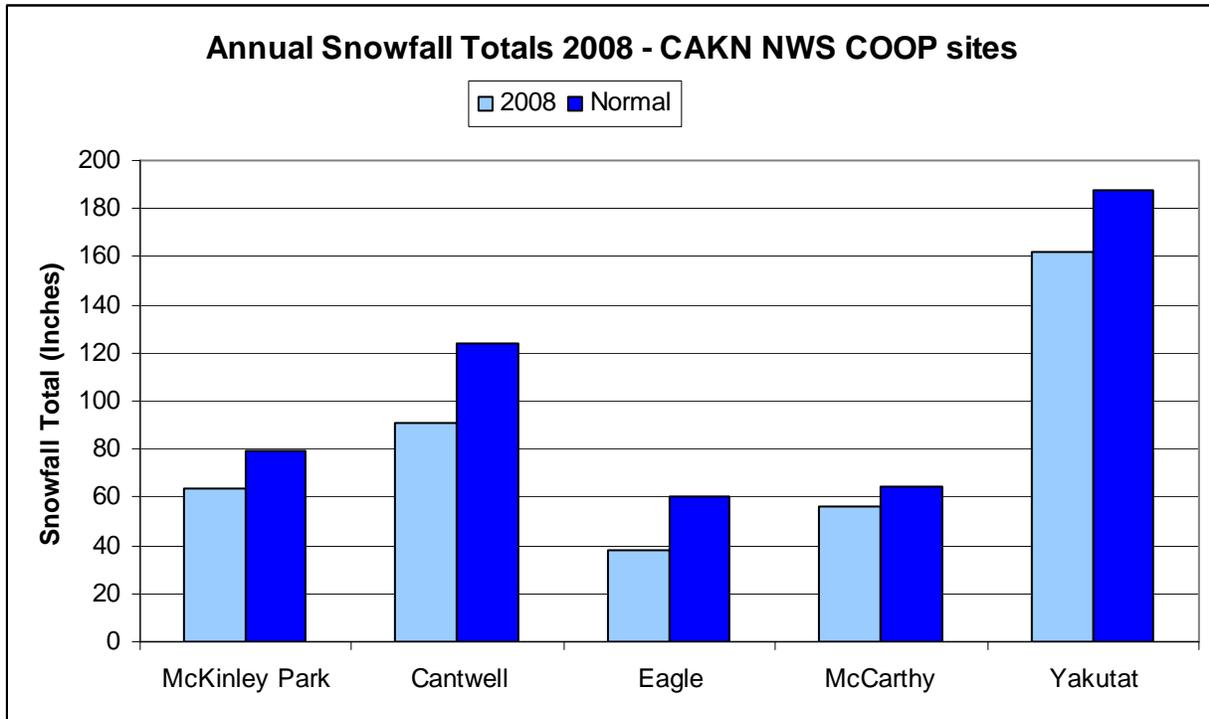
Daily precipitation totals for May Creek for 2007-2008 season Oct 1 – Sep 30.

Unit = inches

day	oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep
---	---	---	---	---	---	---	---	---	---	---	---	---
1	0.0	0.8	2.7	3.1	3.8	4.5	5.4	6.1	6.4	7.6	11.7	16.8
2	0.0	0.8	2.7	3.1	3.8	4.5	5.4	6.1	6.4	7.7	11.7	16.8
3	0.0	0.8	2.7	3.1	3.9	4.5	5.4	6.1	6.4	7.7	11.7	16.8
4	0.0	0.8	2.7	3.1	4.0	4.5	5.4	6.1	6.5	7.7	11.7	16.8
5	0.0	0.8	2.7	3.1	4.0	4.6	5.4	6.1	6.5	7.7	11.8	16.9
6	0.2	0.8	2.7	3.1	4.0	4.6	5.4	6.2	6.5	7.7	13.6	16.9
7	0.2	0.8	2.7	3.1	4.0	4.6	5.4	6.2	6.5	8.0	14.4	16.9
8	0.2	0.8	2.7	3.1	4.0	4.6	5.4	6.2	6.6	8.0	14.5	17.0
9	0.2	0.8	2.7	3.1	4.0	4.6	5.4	6.2	6.6	8.0	14.7	17.0
10	0.2	0.8	2.7	3.1	4.2	4.6	5.4	6.2	6.6	8.0	14.7	17.1
11	0.2	0.8	2.7	3.1	4.2	4.6	5.4	6.2	6.6	8.0	14.7	17.1
12	0.3	0.8	2.8	3.3	4.2	4.6	5.4	6.2	6.6	8.0	14.7	17.1
13	0.3	0.8	2.8	3.3	4.2	4.6	5.5	6.2	6.6	8.0	14.7	17.1
14	0.3	0.8	2.8	3.3	4.2	4.6	5.6	6.2	6.6	8.0	14.7	17.2
15	0.3	2.7	2.9	3.3	4.3	4.6	5.6	6.2	6.7	8.0	14.7	17.2
16	0.3	2.7	3.0	3.3	4.3	4.6	5.6	6.2	6.7	8.0	14.7	17.2
17	0.3	2.7	3.0	3.5	4.3	4.6	6.1	6.2	6.8	8.0	14.8	17.3
18	0.3	2.7	3.1	3.5	4.3	4.7	6.1	6.2	6.8	8.1	14.9	17.3
19	0.3	2.7	3.1	3.5	4.3	4.7	6.1	6.2	6.8	8.2	14.9	17.3
20	0.3	2.7	3.1	3.5	4.3	4.7	6.1	6.2	6.8	9.0	14.9	17.4
21	0.4	2.7	3.1	3.5	4.3	4.7	6.1	6.2	6.9	9.0	14.9	17.4
22	0.4	2.7	3.1	3.5	4.3	4.7	6.1	6.2	6.9	9.1	15.1	17.4
23	0.4	2.7	3.1	3.5	4.3	4.7	6.1	6.2	7.2	9.1	15.1	17.4
24	0.5	2.7	3.1	3.5	4.3	4.7	6.1	6.2	7.3	9.2	15.5	17.4
25	0.5	2.7	3.1	3.6	4.3	4.7	6.1	6.3	7.6	9.8	15.8	17.4
26	0.8	2.7	3.1	3.8	4.3	4.7	6.1	6.3	7.6	9.9	16.5	17.4
27	0.8	2.7	3.1	3.8	4.3	4.7	6.1	6.3	7.6	10.2	16.6	17.4
28	0.8	2.7	3.1	3.8	4.3	4.7	6.1	6.3	7.6	11.0	16.6	18.2
29	0.8	2.7	3.1	3.8	4.4	4.9	6.1	6.3	7.6	11.5	16.8	18.3
30	0.8	2.7	3.1	3.8	---	4.9	6.1	6.3	7.6	11.5	16.8	18.3
31	0.8	---	3.1	3.8	---	4.9	---	6.4	---	11.7	16.8	---
mean	0.4	1.8	2.9	3.4	4.2	4.7	5.8	6.2	6.9	8.8	14.7	17.3
max	0.8	2.7	3.1	3.8	4.4	4.9	6.1	6.4	7.6	11.7	16.8	18.3
min	0.0	0.8	2.7	3.1	3.8	4.5	5.4	6.1	6.4	7.6	11.7	16.8

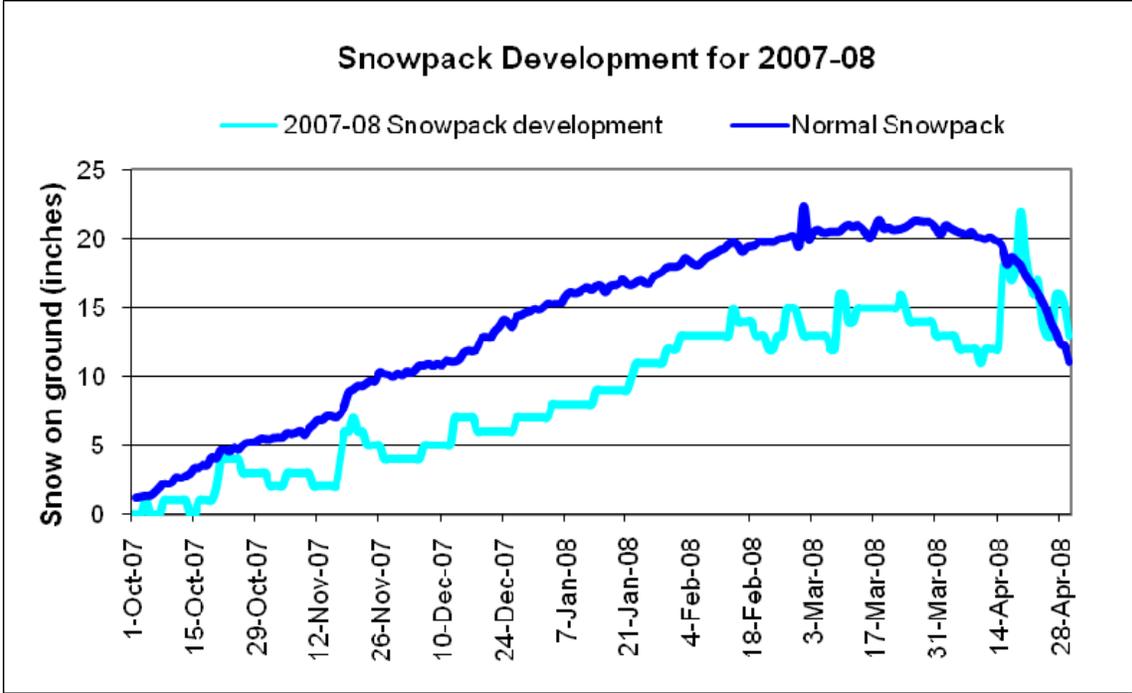
Appendix C. Long-term Snowfall Data –NWS COOP

These data are available courtesy of the Western Regional Climate Center web site at <http://www.wrcc.dri.edu>



NWS COOP sites with monthly snowfall measurements

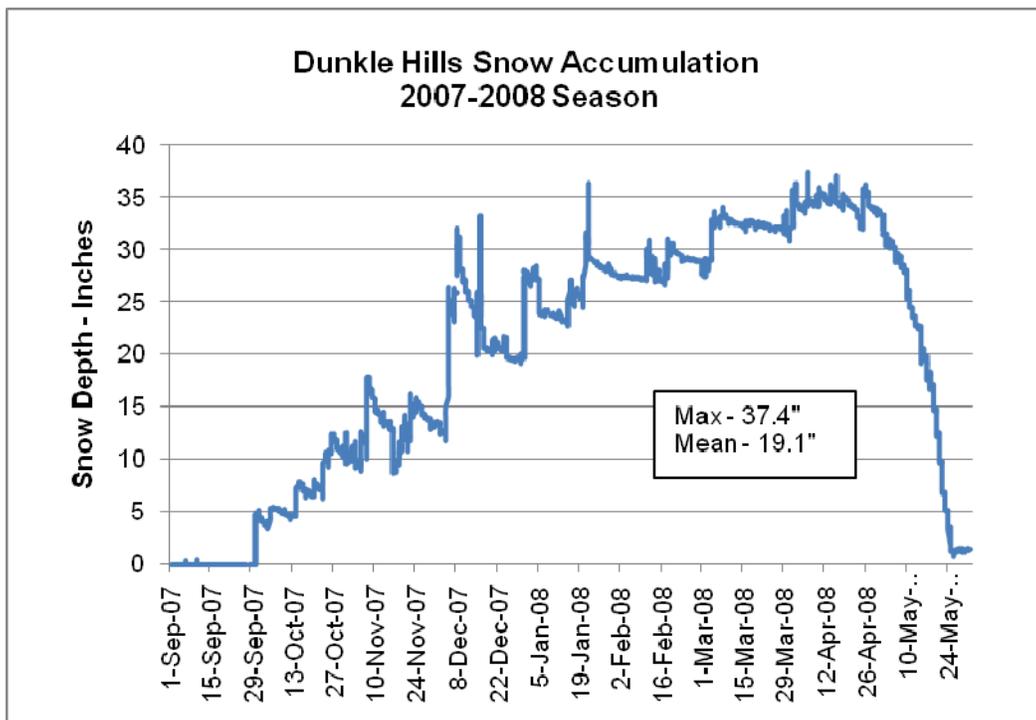
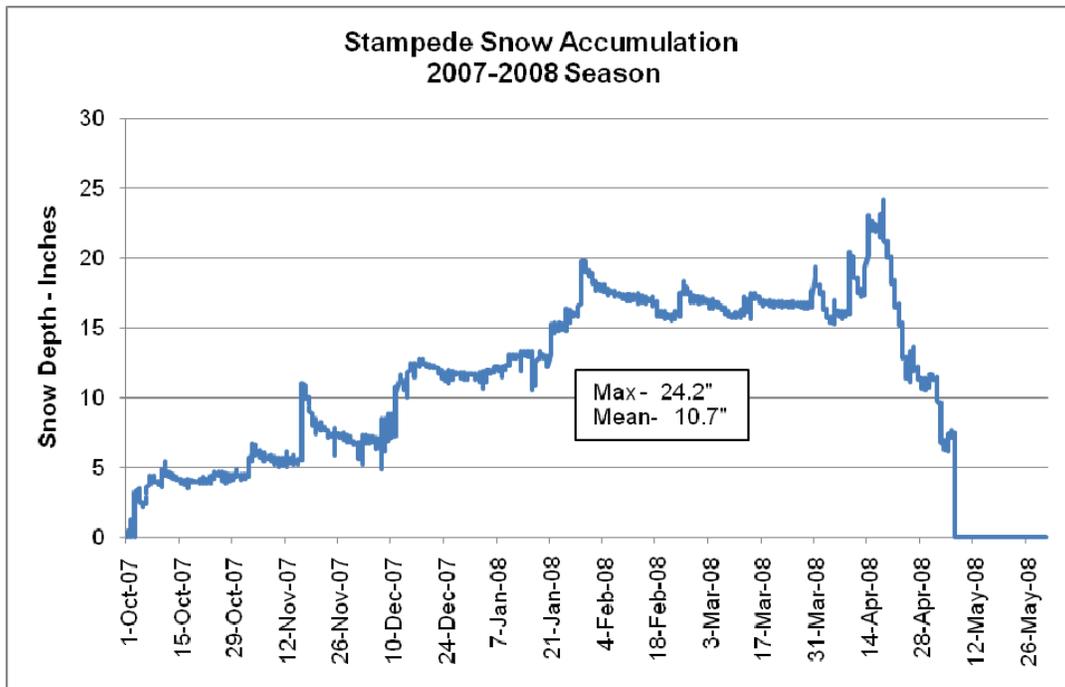
Site	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
McKinley Park (78)													
2007-08	0.0	0.0	0.2	7.3	7.3	5.7	6.8	8.3	5.7	20.8	1.3	0	63.4
MEAN	0.0	0.0	3.3	12.7	12.6	12.5	11.7	9.8	7.8	5.7	2.6	0.2	79.7
Cantwell (24)													
2007-08	0	0	0.5	11.2	10	7	22	9.6	10.1	20.7	0	0	91.1
MEAN	0.3	0.0	4.3	16.3	18.3	21.8	22.2	16.0	12.7	10.6	5.6	0.2	124.0
Eagle (29)													
2007-08	0	0	0	8	5	7	6	5	4.3	2.5	0	0	37.8
MEAN	0.0	0.0	0.9	9.6	10.7	11.5	7.8	6.9	5.3	3.1	0.8	0.0	60.0
McCarthy (12)													
2007-08	0	0	0	7.8	17.8	8.8	5*	3.2	11.3	7	0	0	55.9
MEAN	0.0	0.0	2.8	9.9	13.6	12.6	12.7	8.9	5.0	2.4	0.2	0.0	64.6
Yakutat (49)													
2007-08	0	0	0	0	1.1	23.3	35.9	52.3	29.1	20.1	0.5	0	162.3
MEAN	0.0	0.0	0.0	4.9	21.9	36.3	35.1	35.3	36.8	15.4	1.1	0.0	187.6

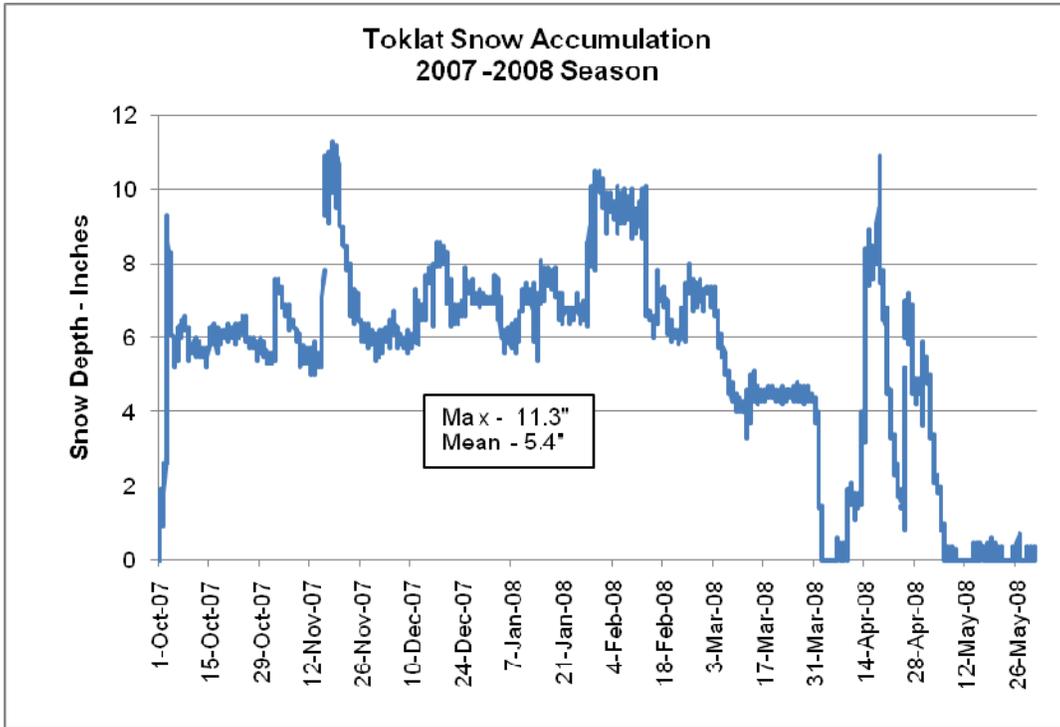


Appendix D. Cumulative Snow Depths at CAKN Climate Stations

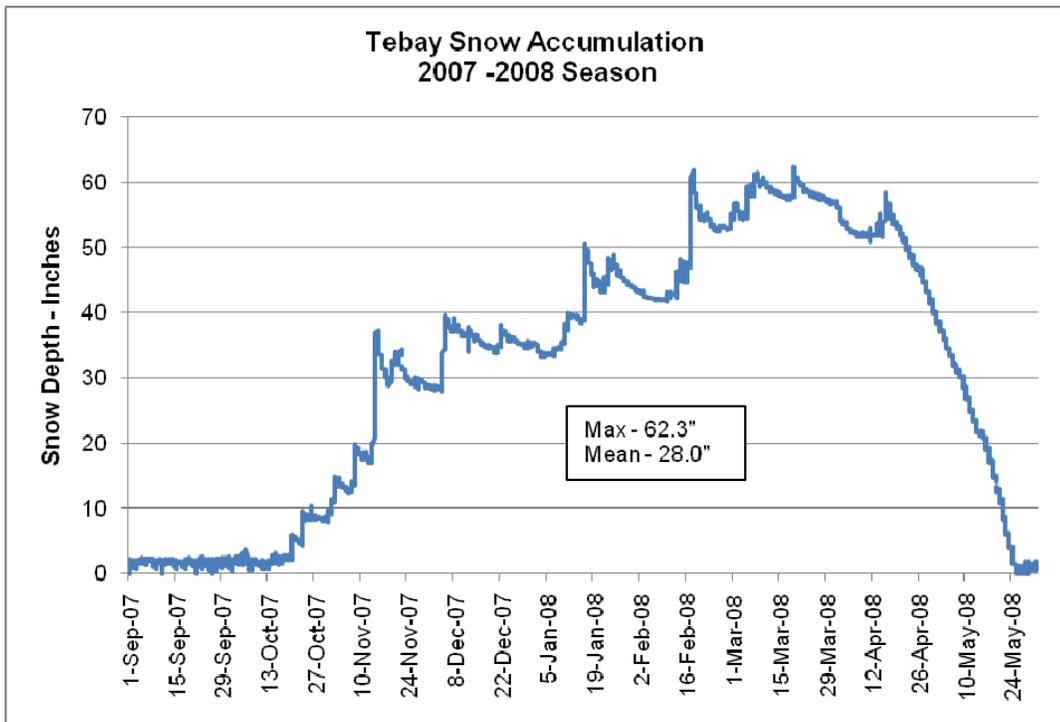
These data and additional graphs are available at <http://www.wrcc.dri.edu/NPS.html>.

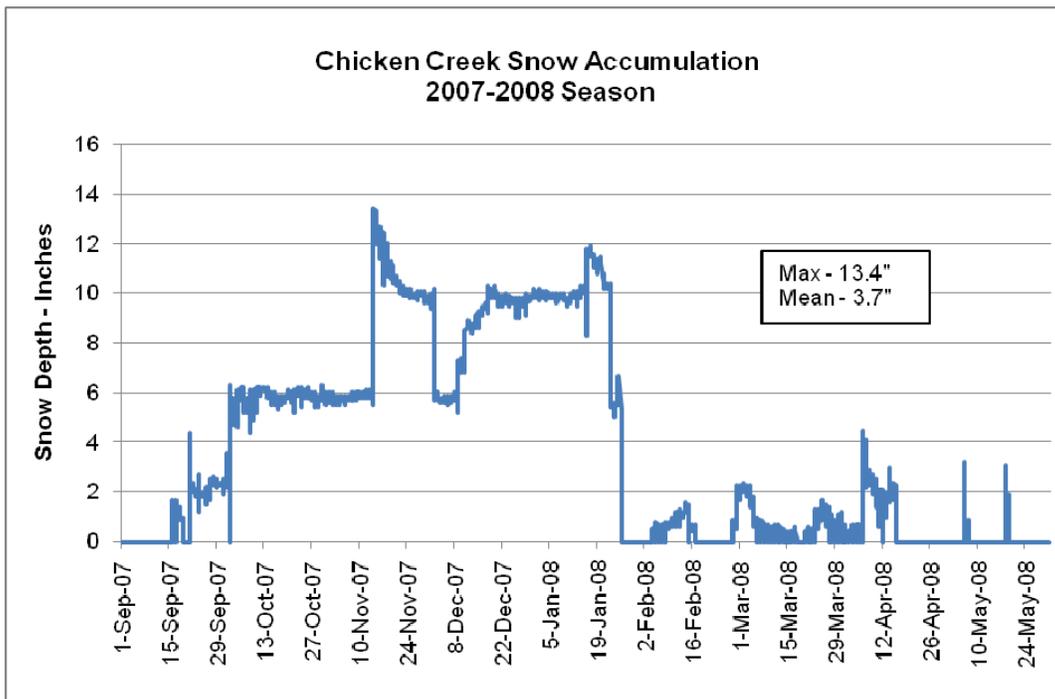
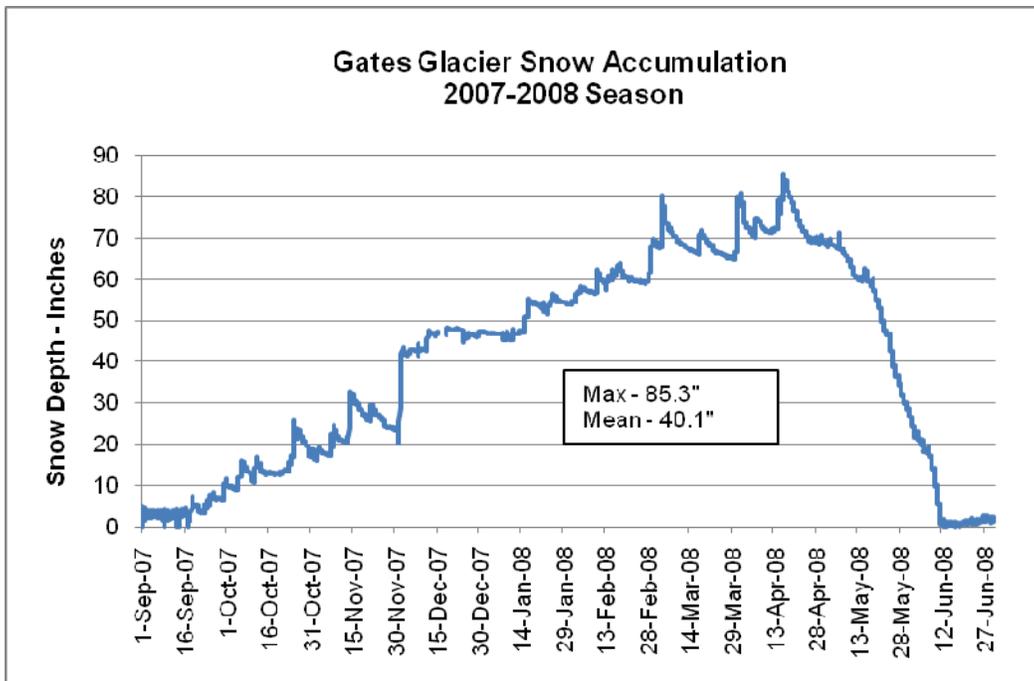
DENA



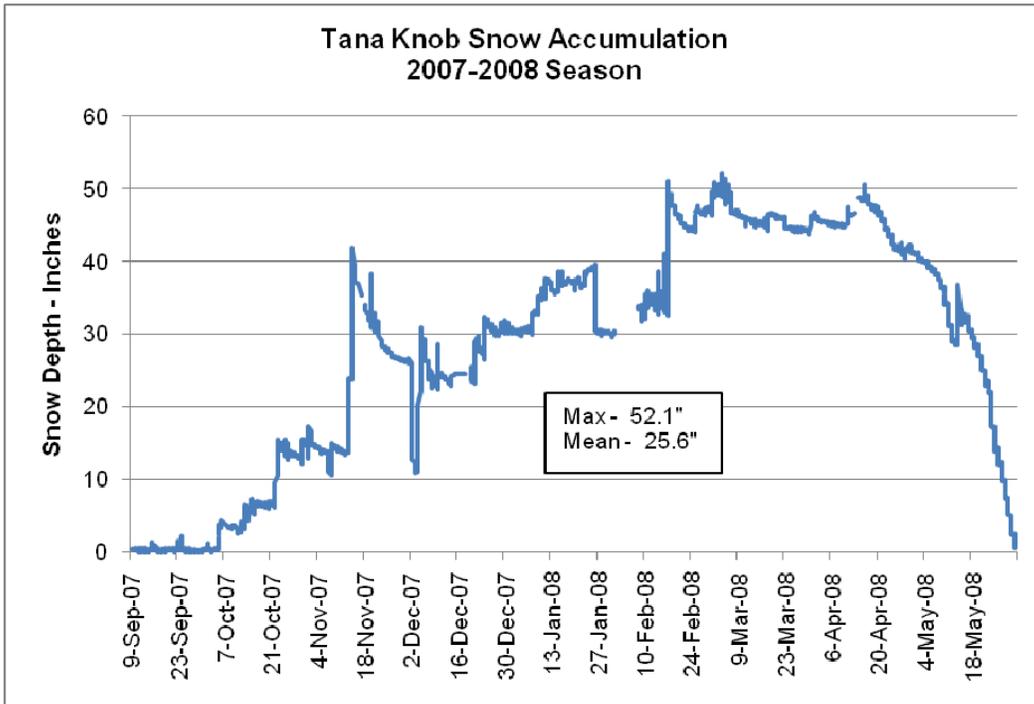
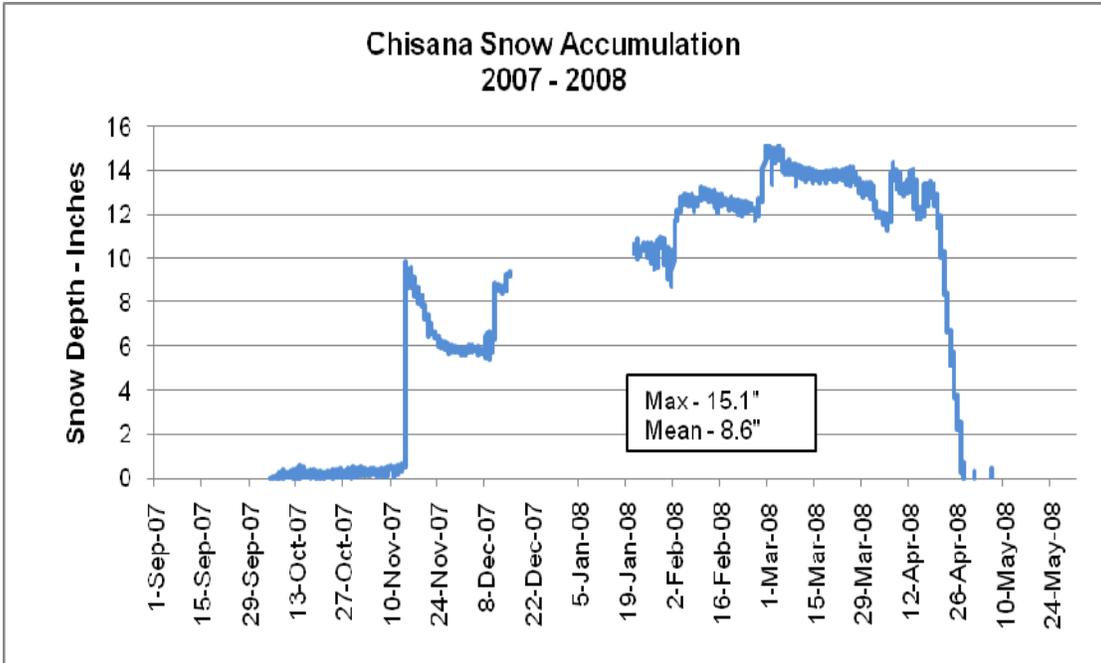


WRST

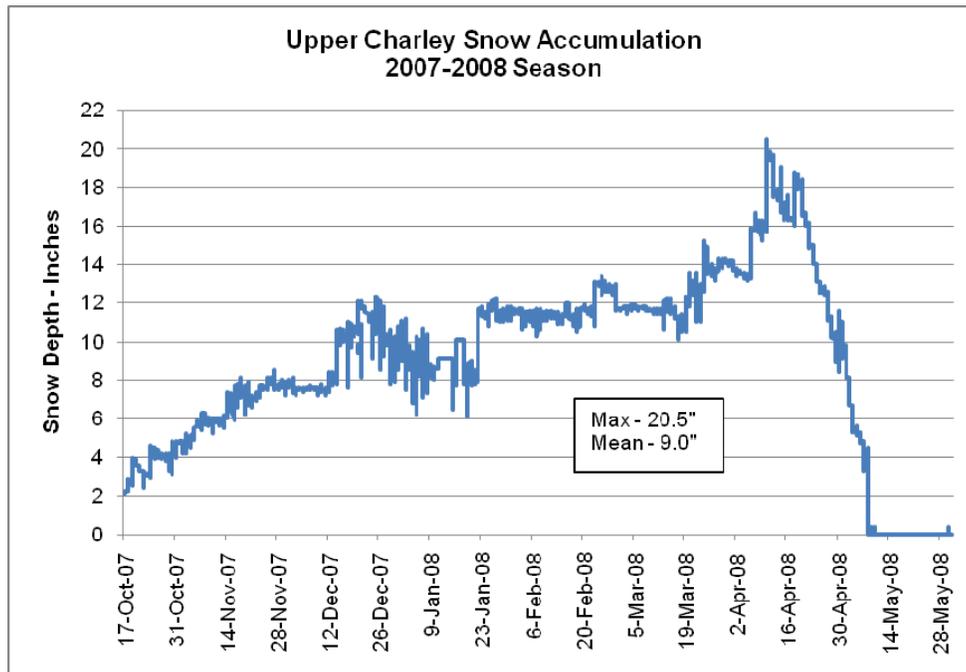
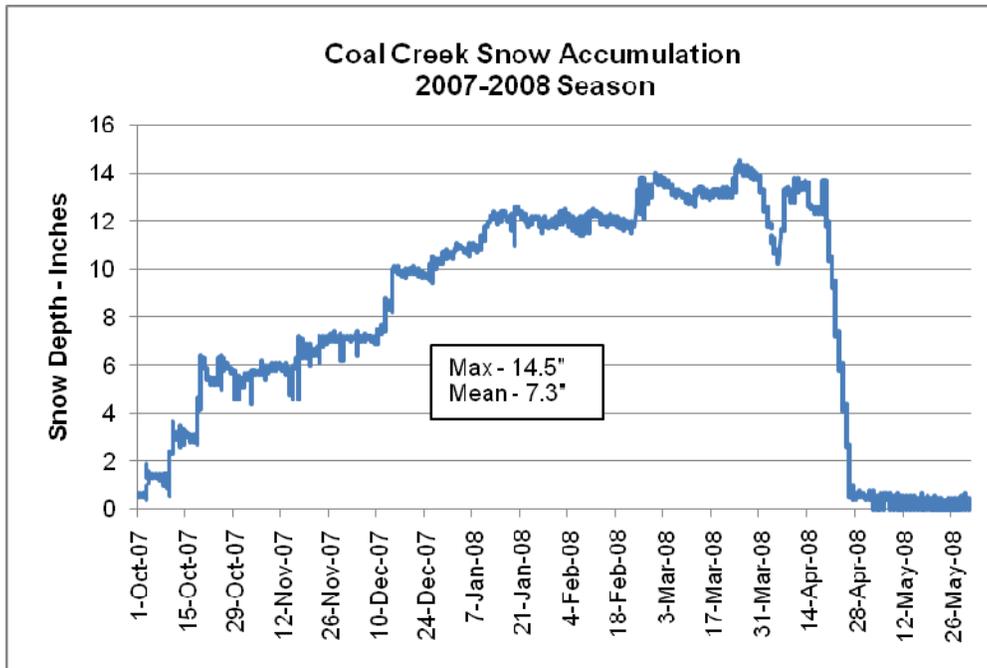




- After January 25th the snow depth data is suspect for Chicken Creek.



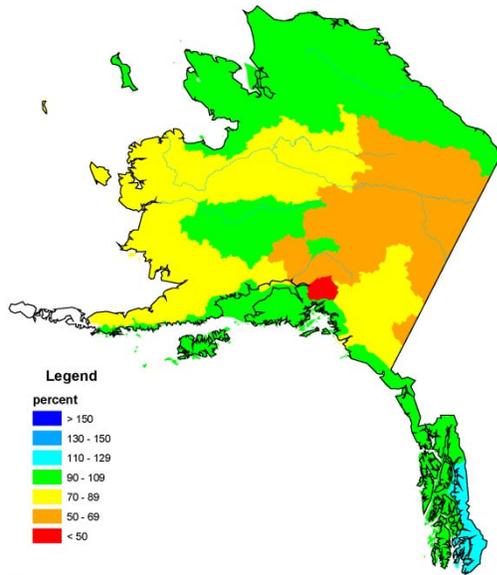
YUCH



Appendix E. Statewide Snowpack Maps for 2007 - 2008

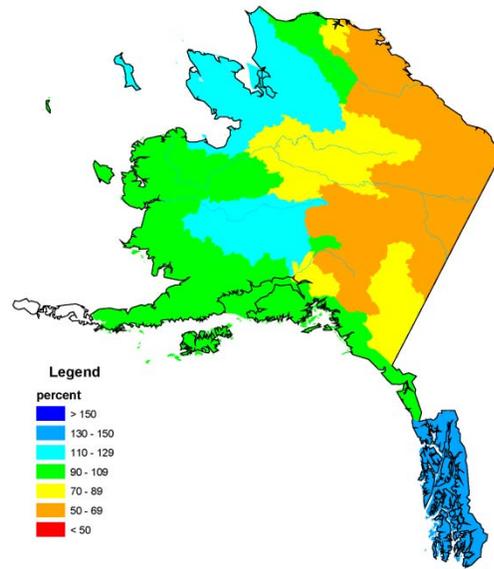
Published by the Natural Resources Conservation Service each month during the season and available online at http://www.wcc.nrcs.usda.gov/cgibin/ak_snow.pl?state=alaska

**Alaska Snowpack
as of January 1, 2008**



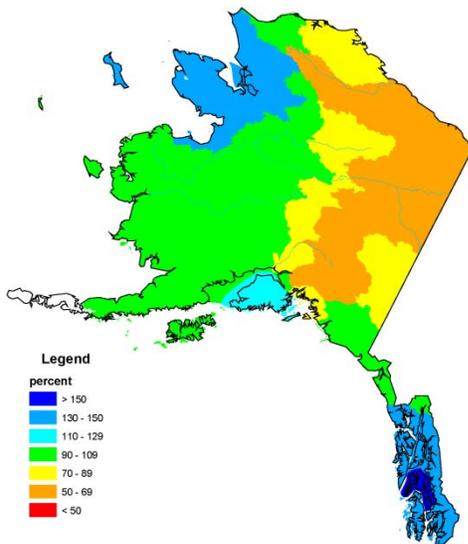
Prepared by
USDA, Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
<http://www.wcc.nrcs.usda.gov>

**Alaska Snowpack
as of February 1, 2008**



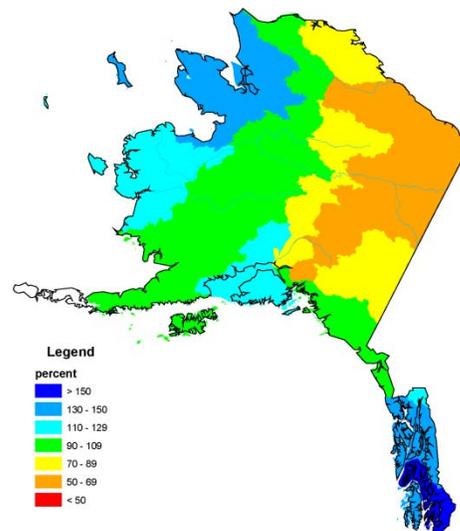
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**Alaska Snowpack
as of March 1, 2008**



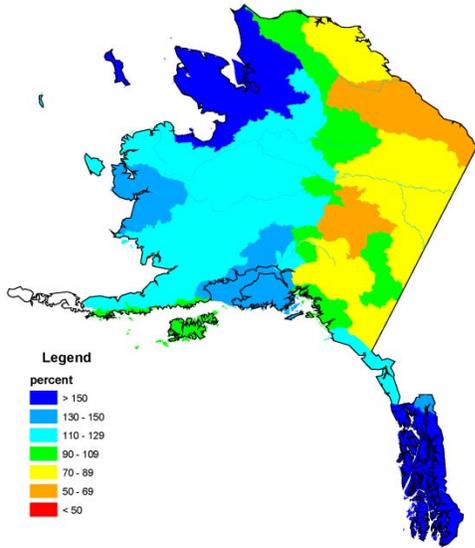
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**Alaska Snowpack
as of April 1, 2008**



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**Alaska Snowpack
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