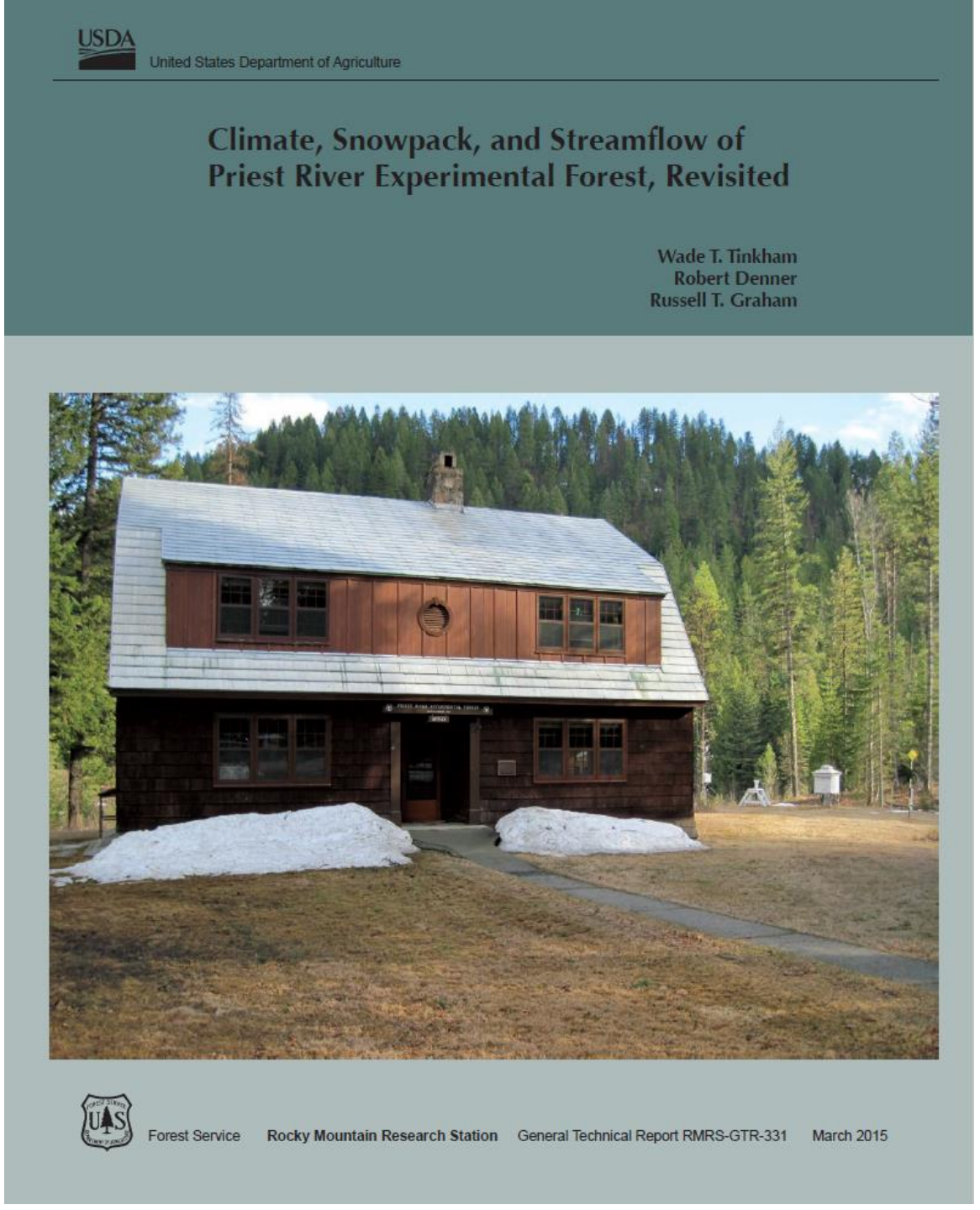
Priest River Experimental Forest

100 Year Climate Review

Excerpts from…

Climate last summarized by Finklin in 1983. Climate of Priest River Experimental Forest, northern Idaho. GTR-INT-159



Priest River Experimental Forest

Established in 1911.

- Weather collected for 108 years from same location.

Temperature, Precipitation, Humidity, Wind.

- Streamflow data collected for 73 years on Benton

Creek since 1939.

- Snowpack measurements at low and high elevation.
- Other data collected intermittently.

Climate Data

Climate Data Summary-Temperature

Table 1—Monthly average and daily extreme temperatures (°F) at the PREF control weather station from 1911 to 2013.

	Averages			Extremes			
Month	Daily maximum	Daily minimum	Monthly	Highest	Year	Lowest	Year
Jan.	30.5	18.3	24.4	50	2003	-33	1950
Feb.	37.0	20.3	28.7	57	1947	-35	1933
Mar.	45.6	24.7	35.2	71	2004	-18	1945
Apr.	57.0	30.2	43.6	88	1934	-1	1936
May	66.8	37.3	52.1	97	1936	18	1954
June	73.6	43.4	58.5	97	1912	24	1918
July	82.8	46.2	64.6	102	1924	29	1917
Aug.	81.9	44.6	63.3	103	1961	26	1914
Sept.	71.3	38.3	54.8	97	1988	16	1926/1934
Oct.	55.8	32.1	44	83	1935/1943	-5	1935
Nov.	38.9	26.7	32.8	64	1965	-16	1955
Dec.	31.6	21.3	26.5	55	1933	-36	1968
Year	56.1	32	44.1	103	Aug. 1961	-36	Dec. 1968

Climate Data Summary-Temperature

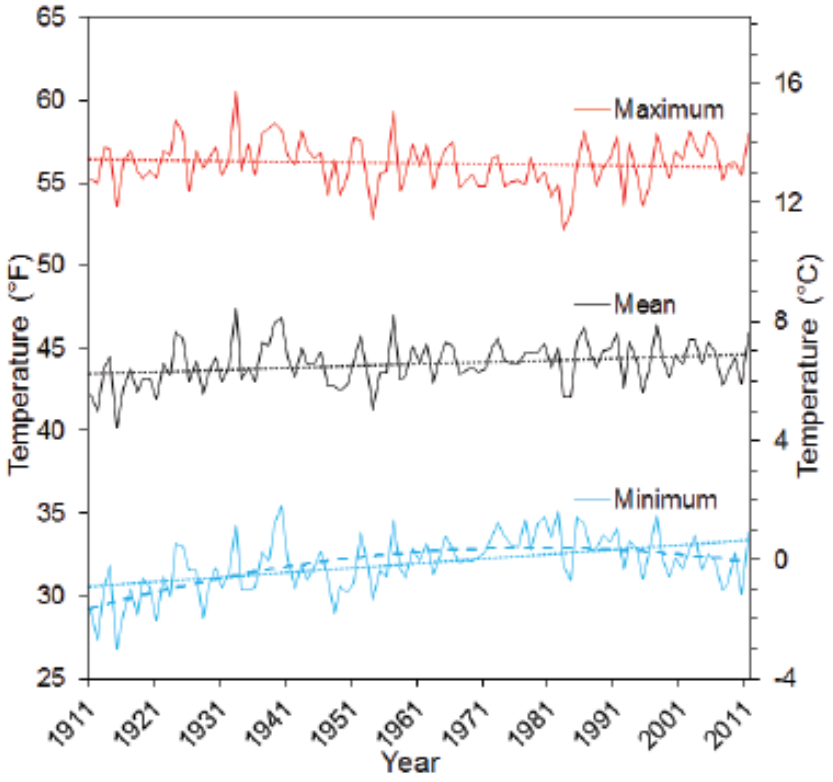
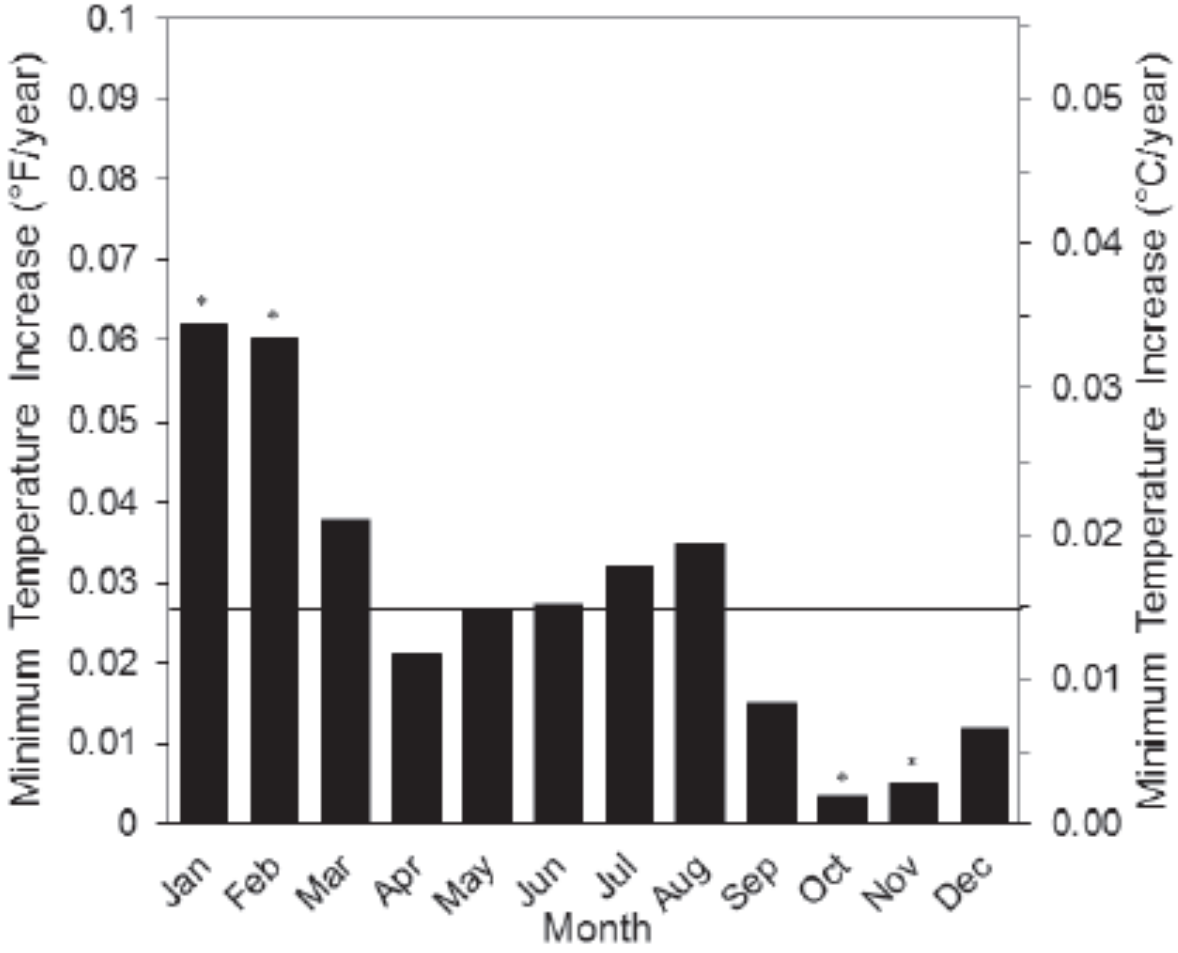


Figure 29—Annual average daily maximum, mean, and minimum temperatures for 1912 to 2012 at the control weather station in PREF, with lines of linear (dotted) and polynomial (dashed) regression overlaid. Analyses show no change in the maximum and mean daily temperatures, while annual daily average minimum temperatures have increasing by 2.8 °F over the last century.

- No change in daily maximum or daily mean temperatures over Last century.
- Daily minimums have increased 2.8 degrees F since 1911.
- All months show increase in minimums but the coldest months, January and February have warmed more rapidly than the mean(6 degrees per century).
- 20 more frost-free days since 1911 (Most in Apr and May).
- 8.6 less days with 1 inch of snow since 1911.
- Found a daytime lapse rate of 4 degrees F per 1000 feet elev.

Temperature



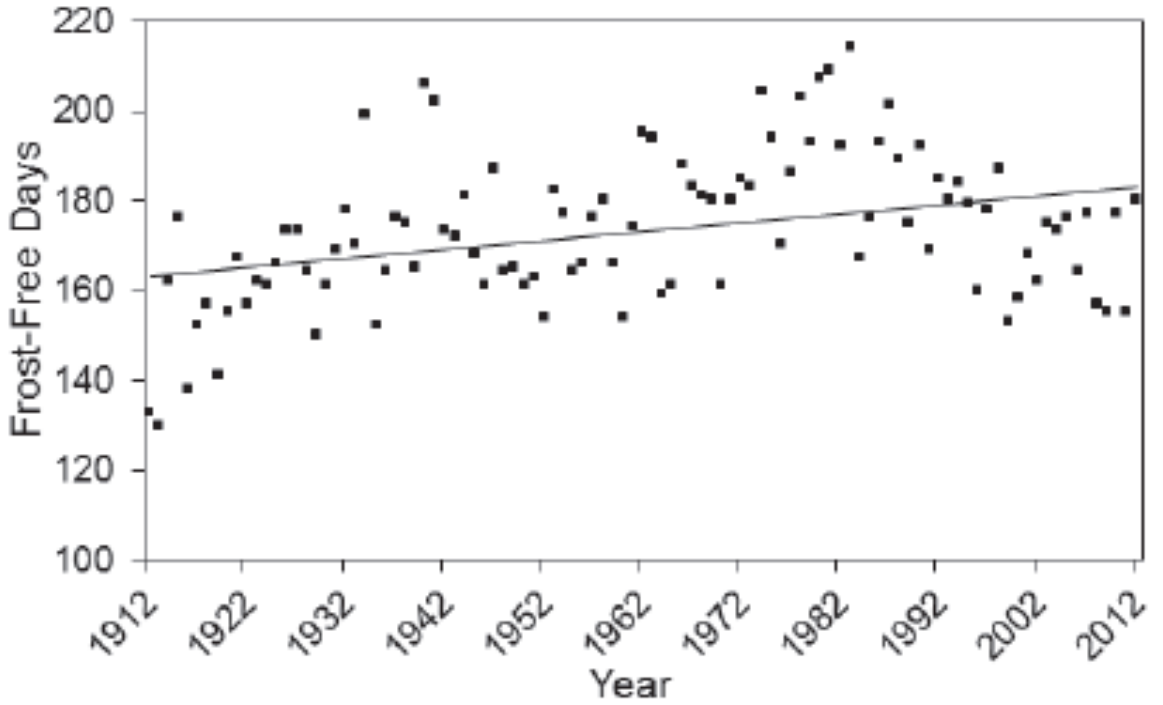


Figure 31—Number of frost-free days per year from 1912-2012; a day was counted if the minimum temperature did not go below 32 °F (0 °C). The line denotes a linear regression and shows that over the last century the growing season length has increased by approximately 20 days.

Precipitation

- Control receives an average of 31.4” per year with SD 5.6”
- 40% comes in November, December, and January
- 13% comes in July, August and September
- Benton Spring (4800 feet elev) averages 4.5 inches greater per year than control station (2400 feet elev)
- No statistically significant trend in precip in the last century

Snowpack

- 2 manual snow courses- Benton
  station at 2300’ elevation and Be
  at 4800’ elevation
- Cooperative with NRCS. Measure
- Benton Spring March 1st snowpa
  Benton Meadow averages 18.6”

Snowpack-Snowfall

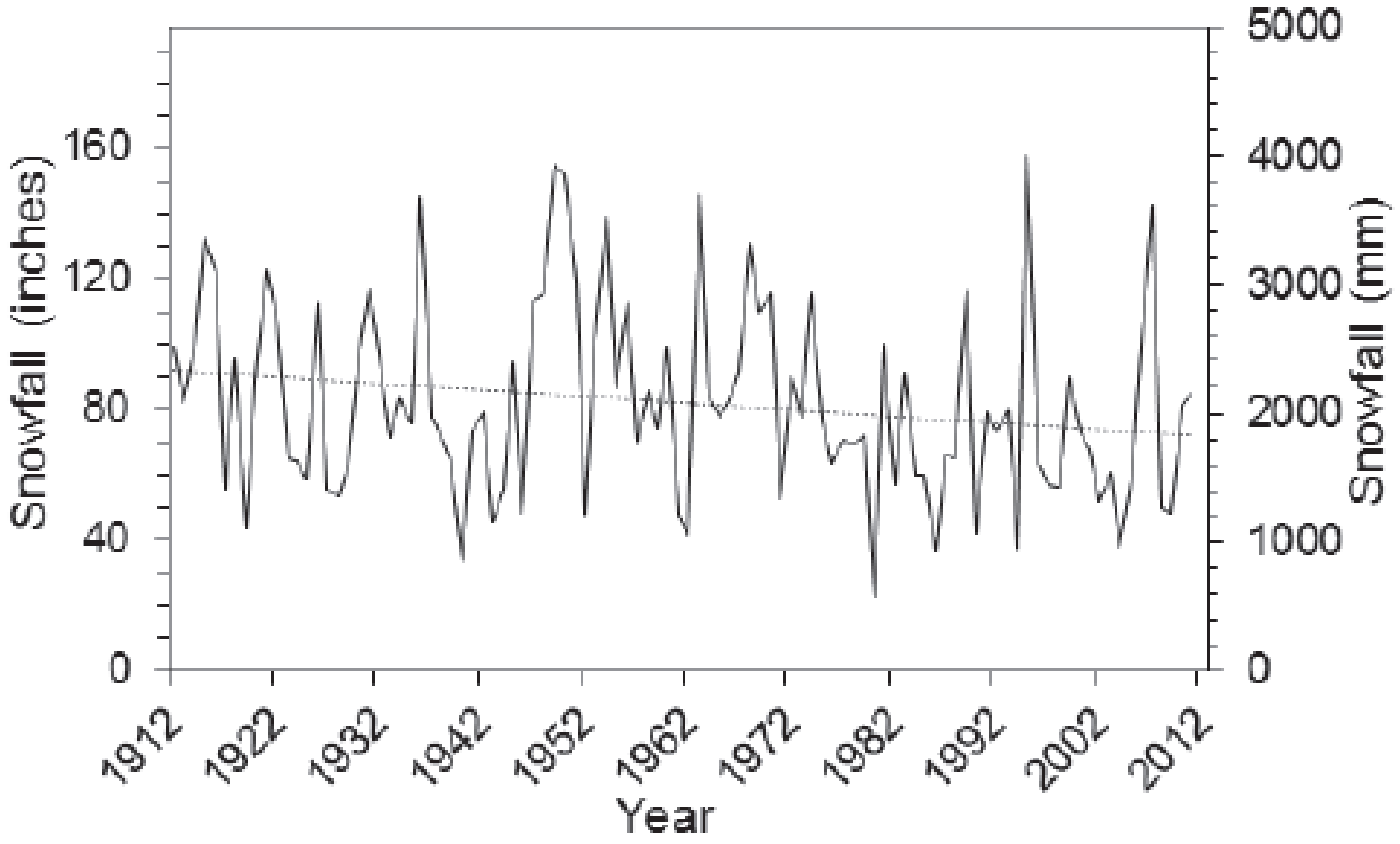


Figure 21—Cumulative annual snowfall at the low-elevation control station for 1912 to 2012, with a linear regression line plotted through the data. Over the last century cumulative snowfall at the lower elevations of the watershed has declined by approximately 20 inches.

Snowpack

- Benton Meadow: Snow depth and SWE at March 1st declining 0.11 inch per year since 1930s. This is 30% reduction or 1/3 less water than the 1930s.
- Benton Spring: March 1st Snowpack regression shows a negative slope but no significant decline.

Snowpack

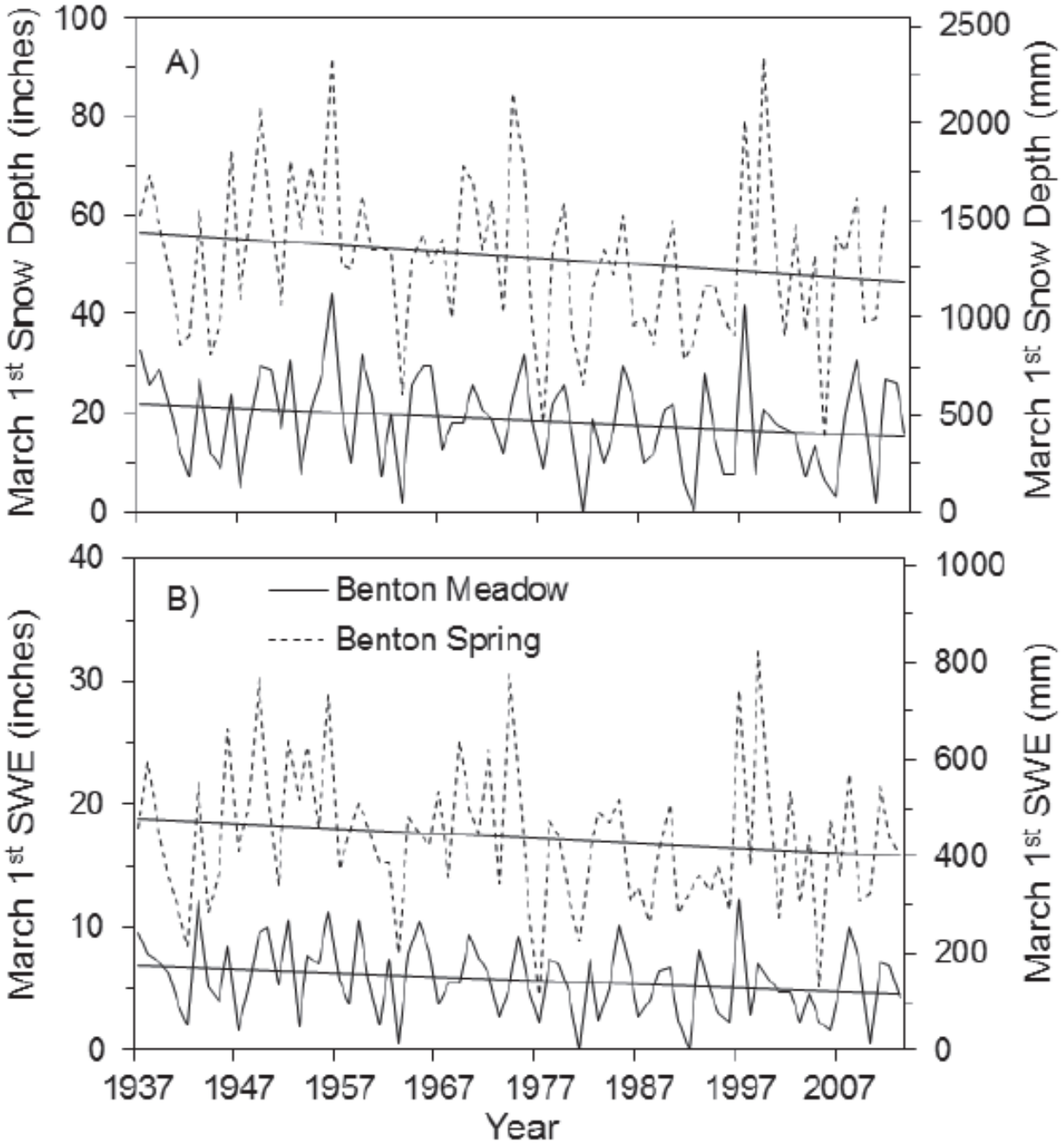


Figure 22—Comparison of the low elevation Benton Meadow (solid line) and high elevation Benton Spring (dashed line) snow courses from 1937 to 2013. The comparisons show the March 1st (A) snowpack depth and (B) snow water equivalent (SWE), where the line through each dataset represents a linear regression.

Snowpack

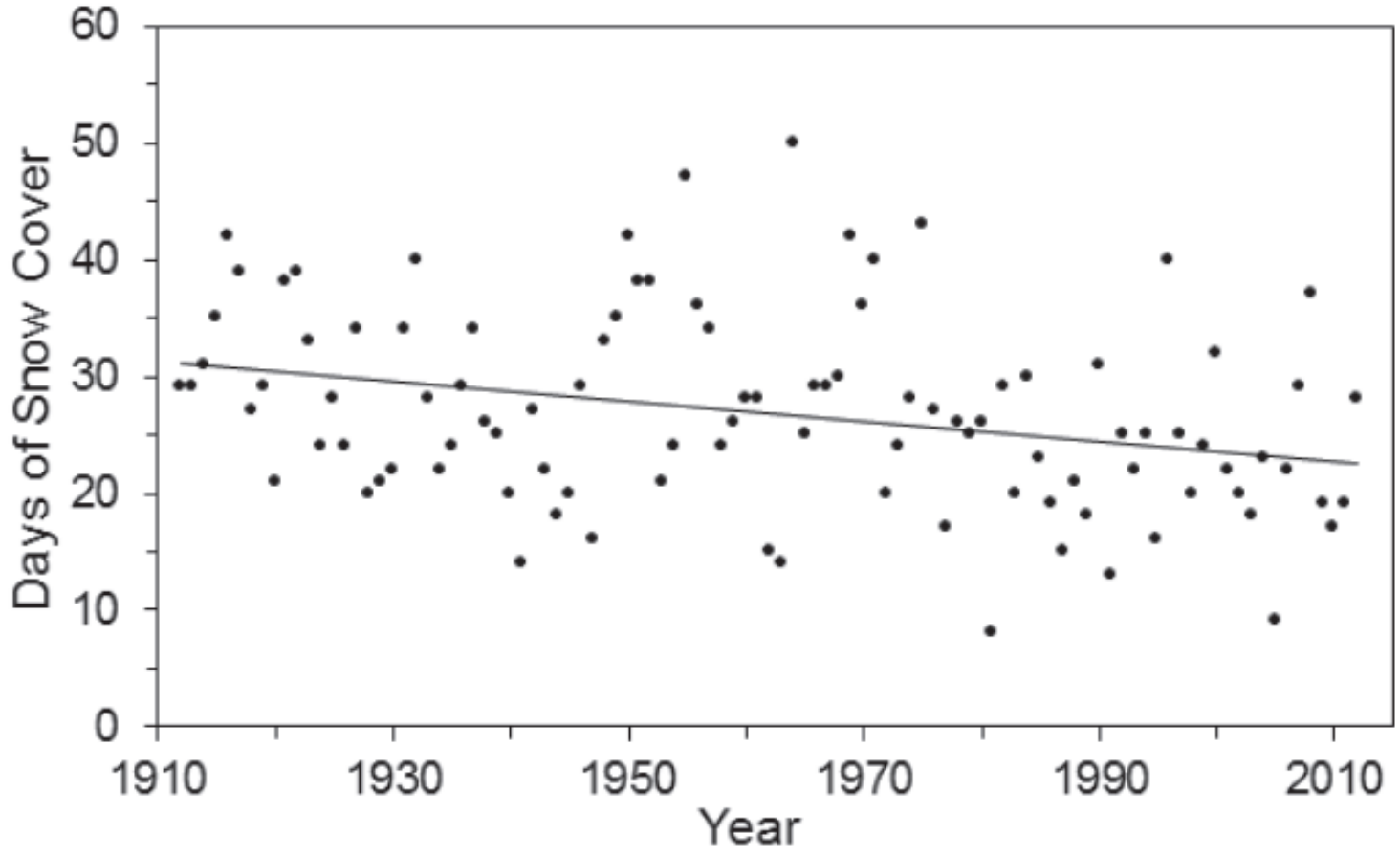


Figure 33—Number of days per year with at least 1 inch of snow at the control weather station in PREF, with a linear regression plotted through the data. Over the last century there has been a decline of approximately 9 days of snow cover.

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- Av
- His
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Streamflow

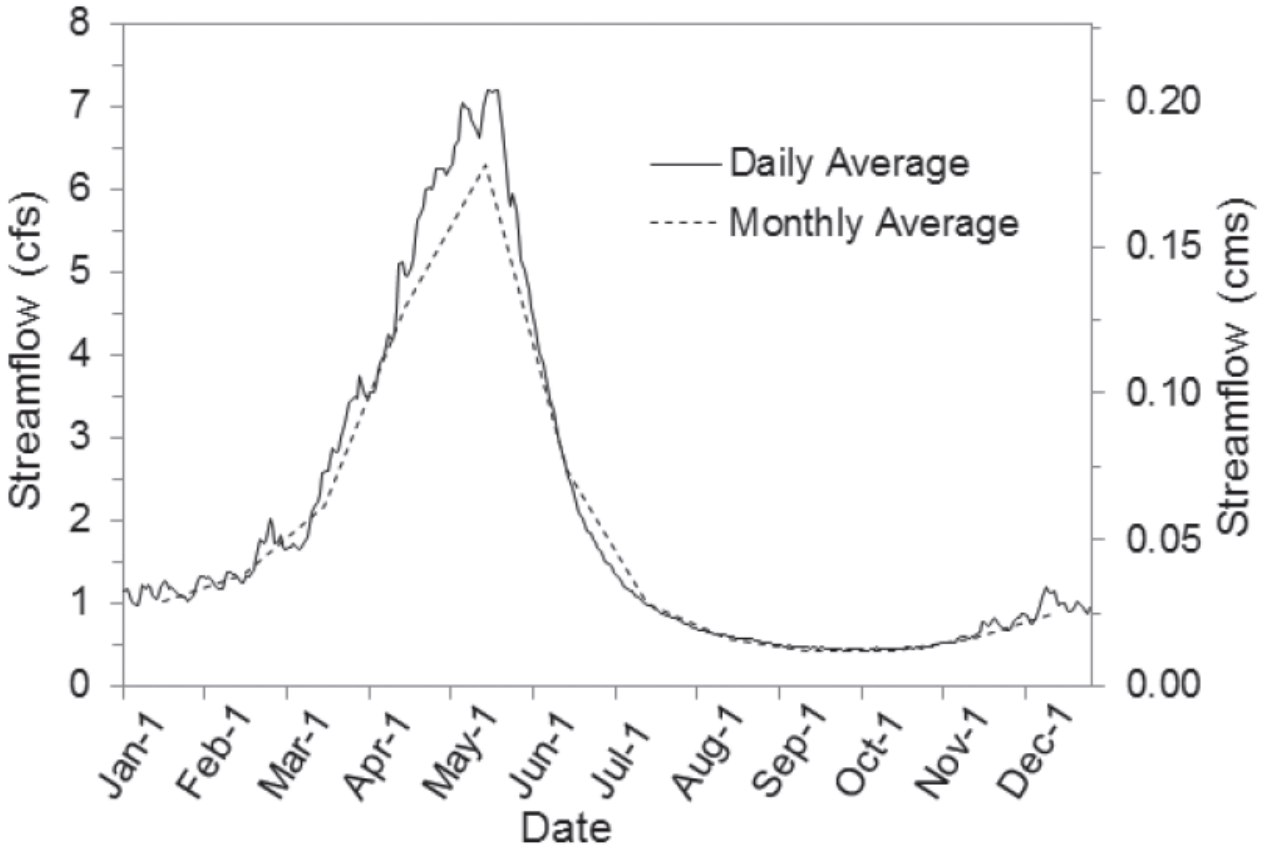

Figure 23—Seasonal distribution of streamflow in both cubic feet per second (cfs) and cubic meters per second (cms) averaged monthly since 1939 and daily since 1955 until early 2012 at the Benton Dam gauging station.

Streamf

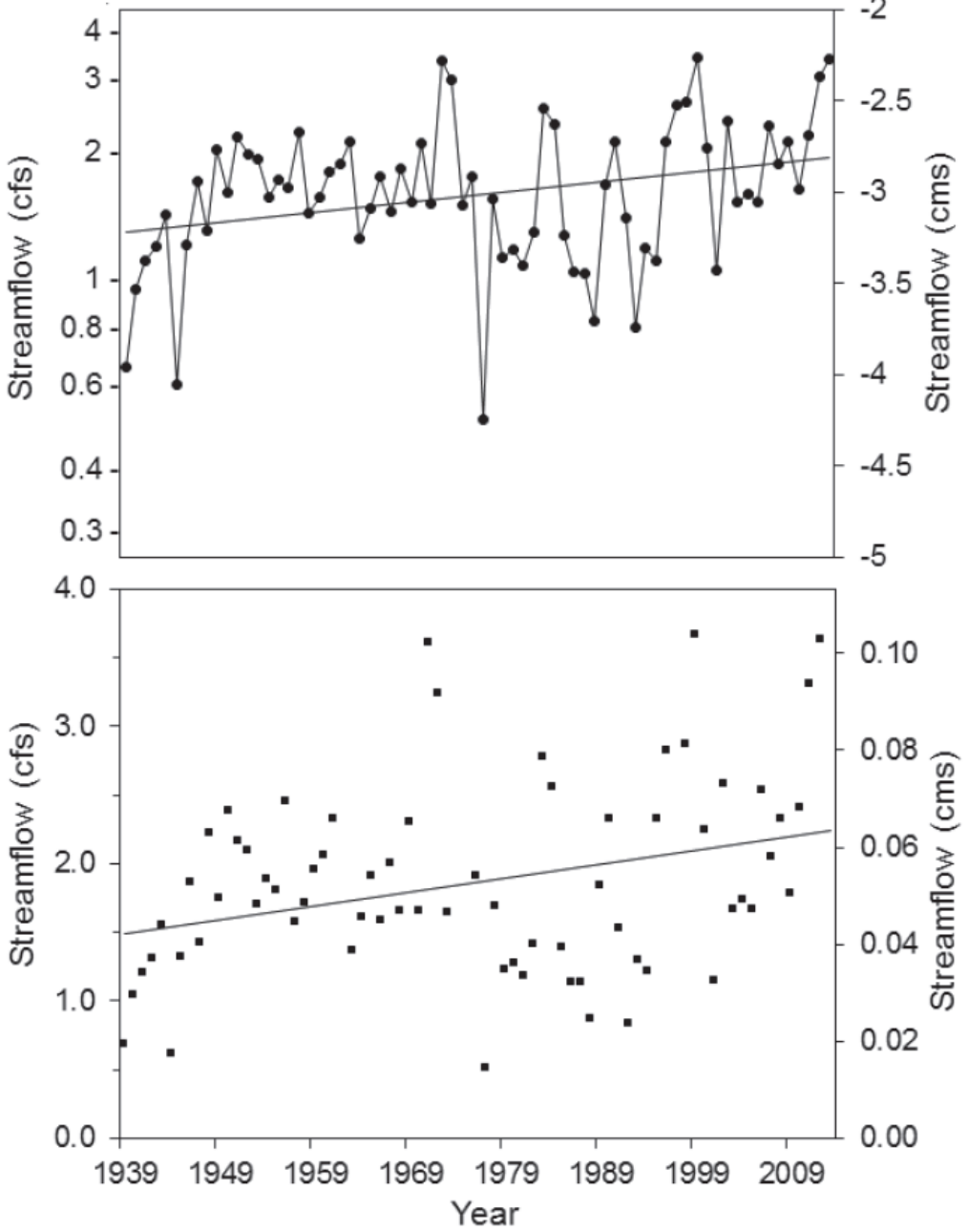

Figure 25—Average annual stream flow from 1939 through 2012, log transformed on top and presented as the raw data on bottom. Both graphs are plotted with a linear regression through the data, showing an approximate 33% increase in streamflow over the 73 years of observation.

Variability has increased;
1983 max min =25.3” and 6”
2015 max min =33.5” and 4.6”

33% increase in streamflow in 73 years

Strean

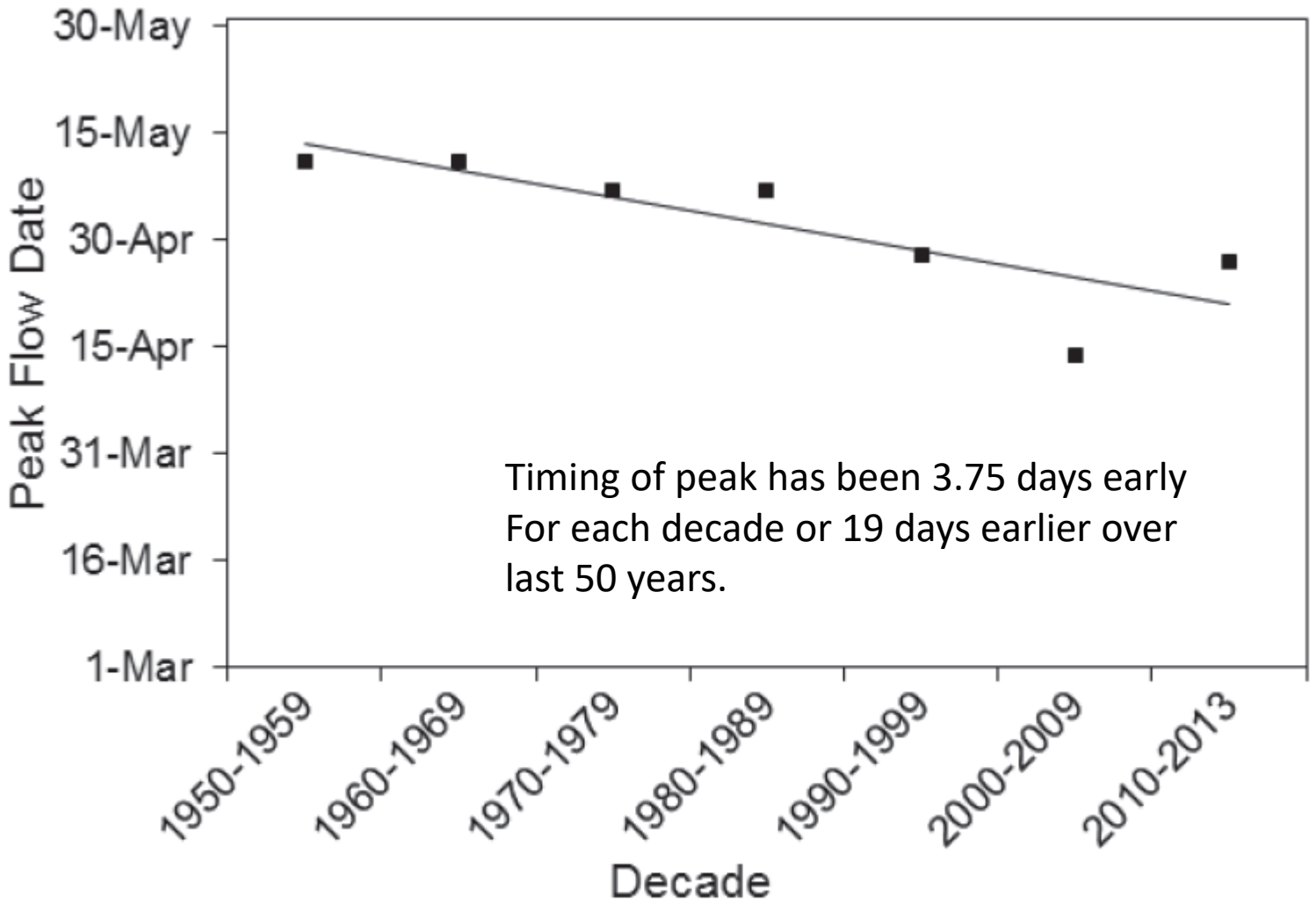

Figure 27—Timing of peak decadal streamflow over the last 60 years, with a linear regression plotted through the data. The regression shows that peak streamflow has shifted 3.75 days early each decade.

Streamflow Discussion

- Streamflow increased with no measureable increase in precip
- Luce and Holden 2009 found decreasing streamflow in large basins
- Birsan et al. 2005 and Jones 2011 found similar results to Benton Cr
- Canopy and deep drainage likely haven’t changed much
- Change due to tree species composition?
- ?

Questions?

- Answers?