SWE Analysis

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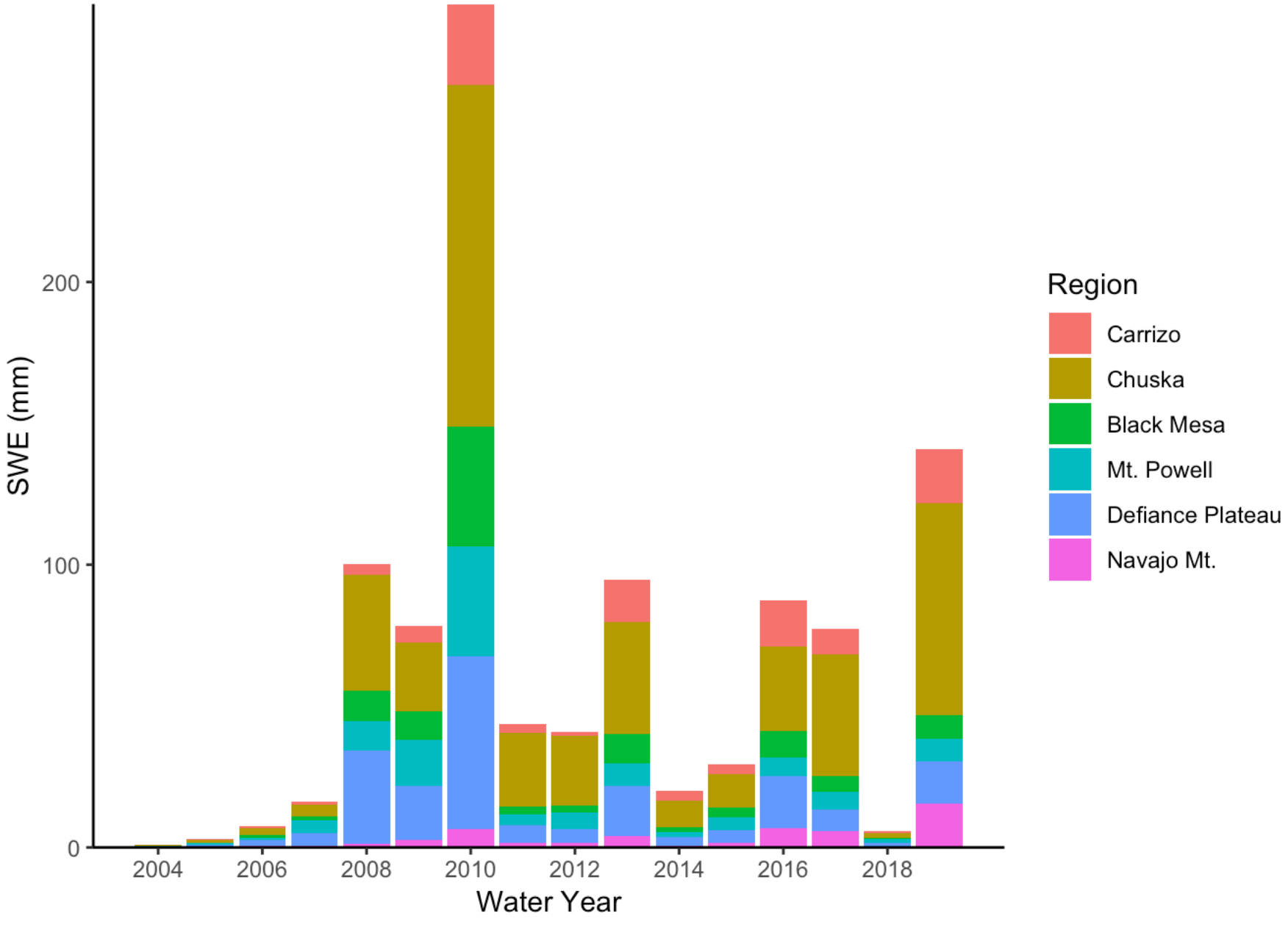
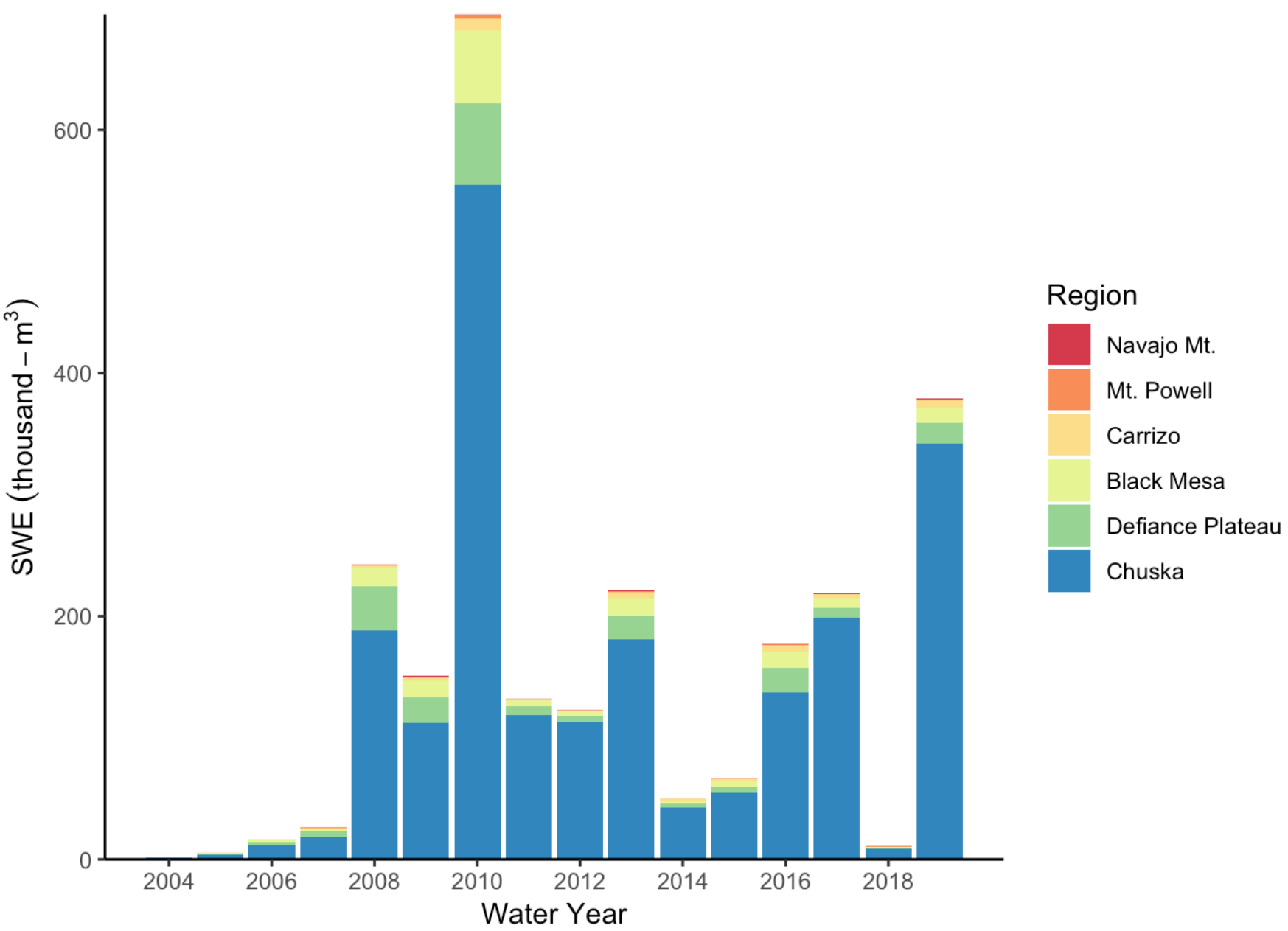
Analyses:

- All three regions generally follow the same trends in SWE over time
- 2010 was a high SWE year
- Black Mesa and Carrizo are the most closely correlated

Annual avereage SWE



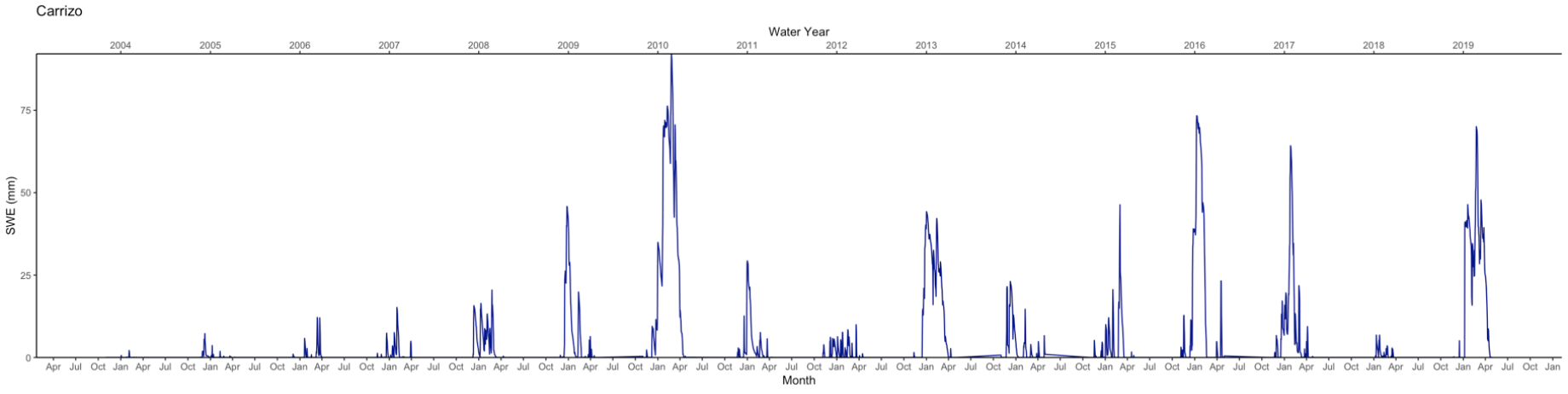
- low swe 2004-2007 and 2018
- Carrizo always has highest average SWE value, while Navajo mountain usually has the least

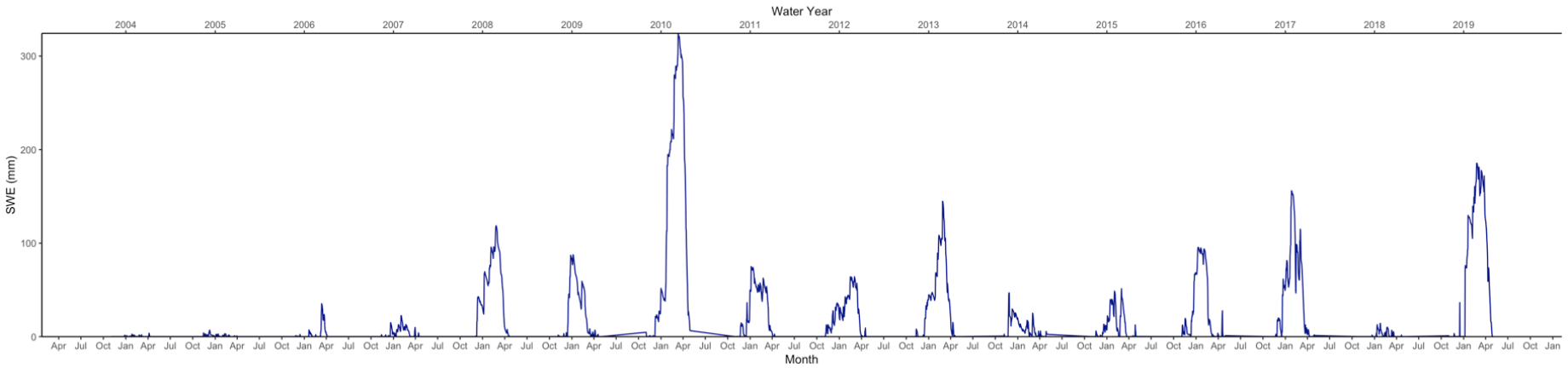


The annual average % contribution to the total annual average swe of all 6 mountain ranges:

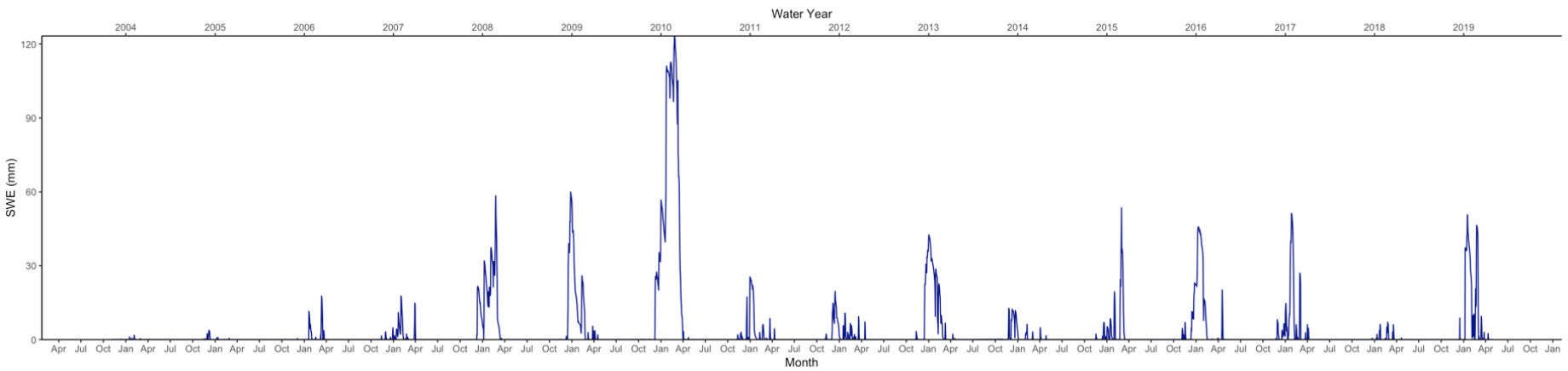
- Chuska: 0.81
- Defiance Plateau 0.11
- Black Mesa 0.06
- Carrizo: 0.02
- Navajo Mt 0.0023
- Mt Powell 0.0049

Daily SWE variability (November - April Water Year)


Carrizo
Water Year
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
SWE (mm)
75
50
25
0
Apr Jul Oct Jan Apr Jul Oct Jan Apr Jul Oct Jan

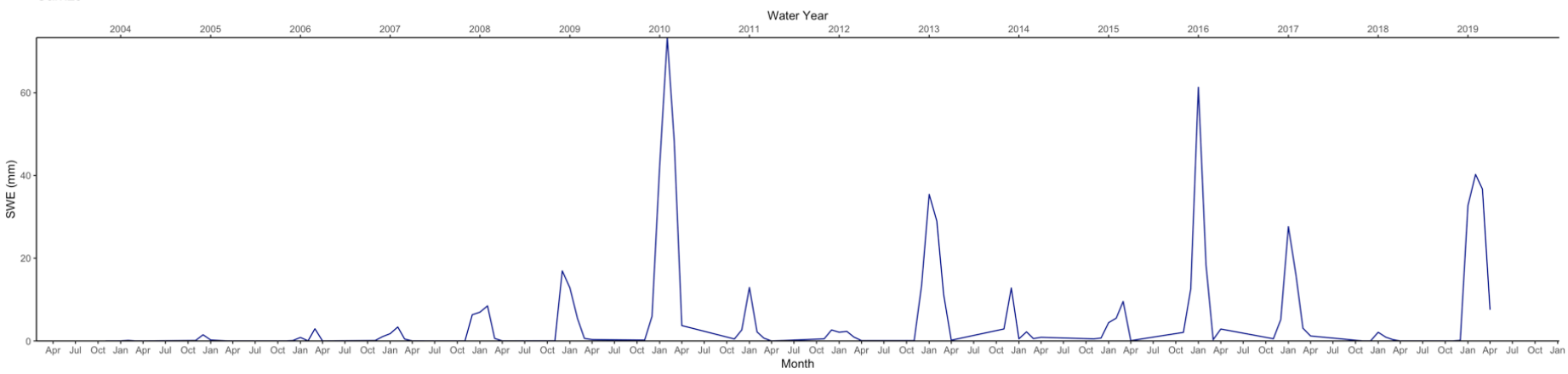


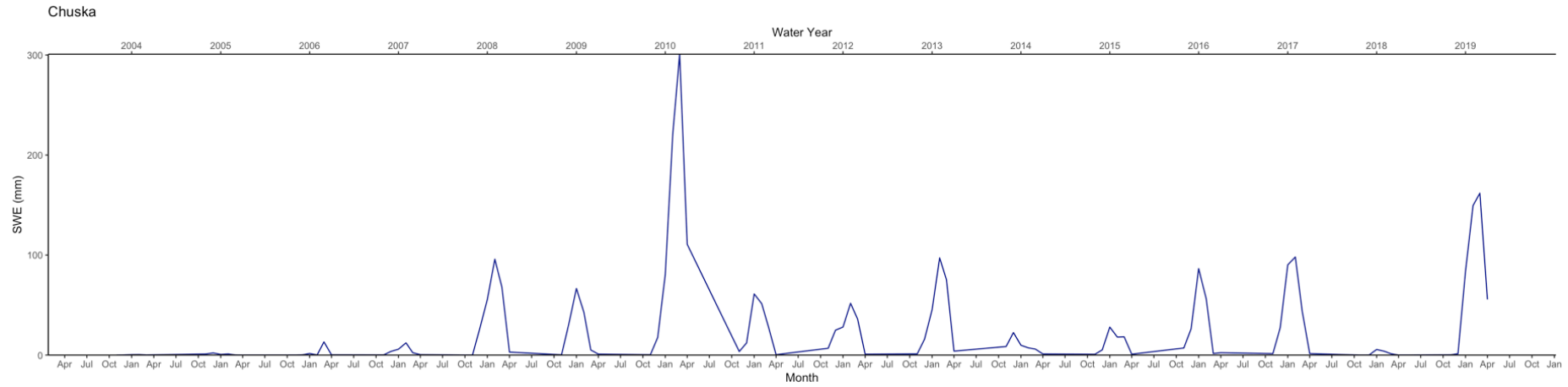
Black Mesa

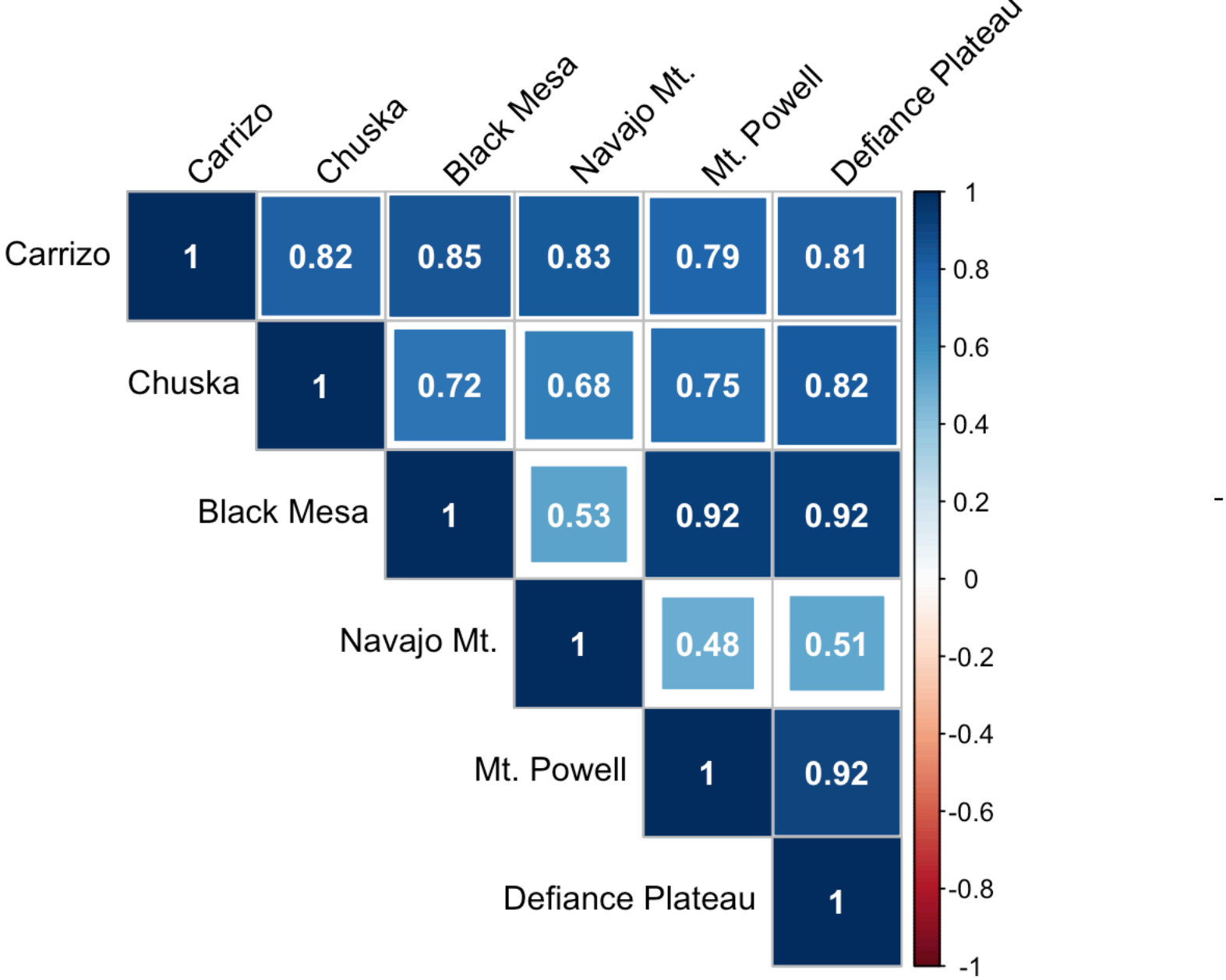


Monthly Mean SWE variability (November - April Water Year)

Carrizo

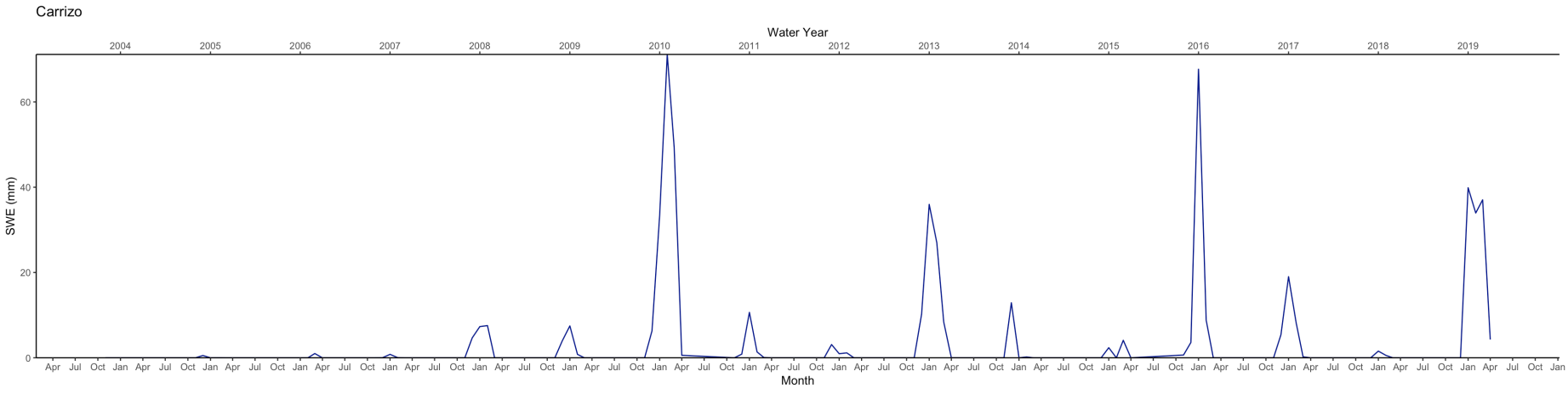



Chuska
Water Year
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
SWE (mm)
0
100
200
300
Apr Jul Oct Jan Apr Jul Oct Jan Apr Jul Oct Jan

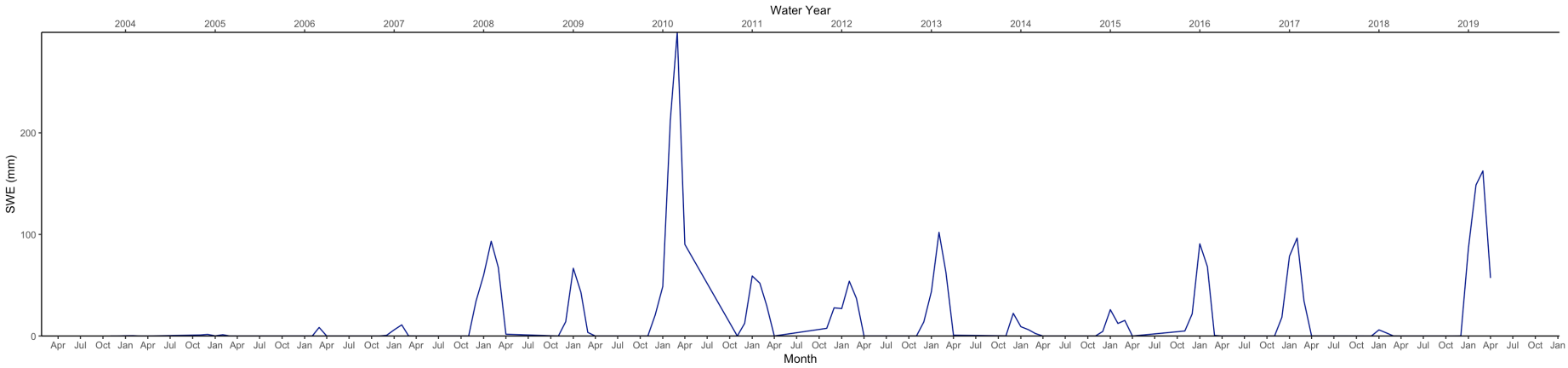


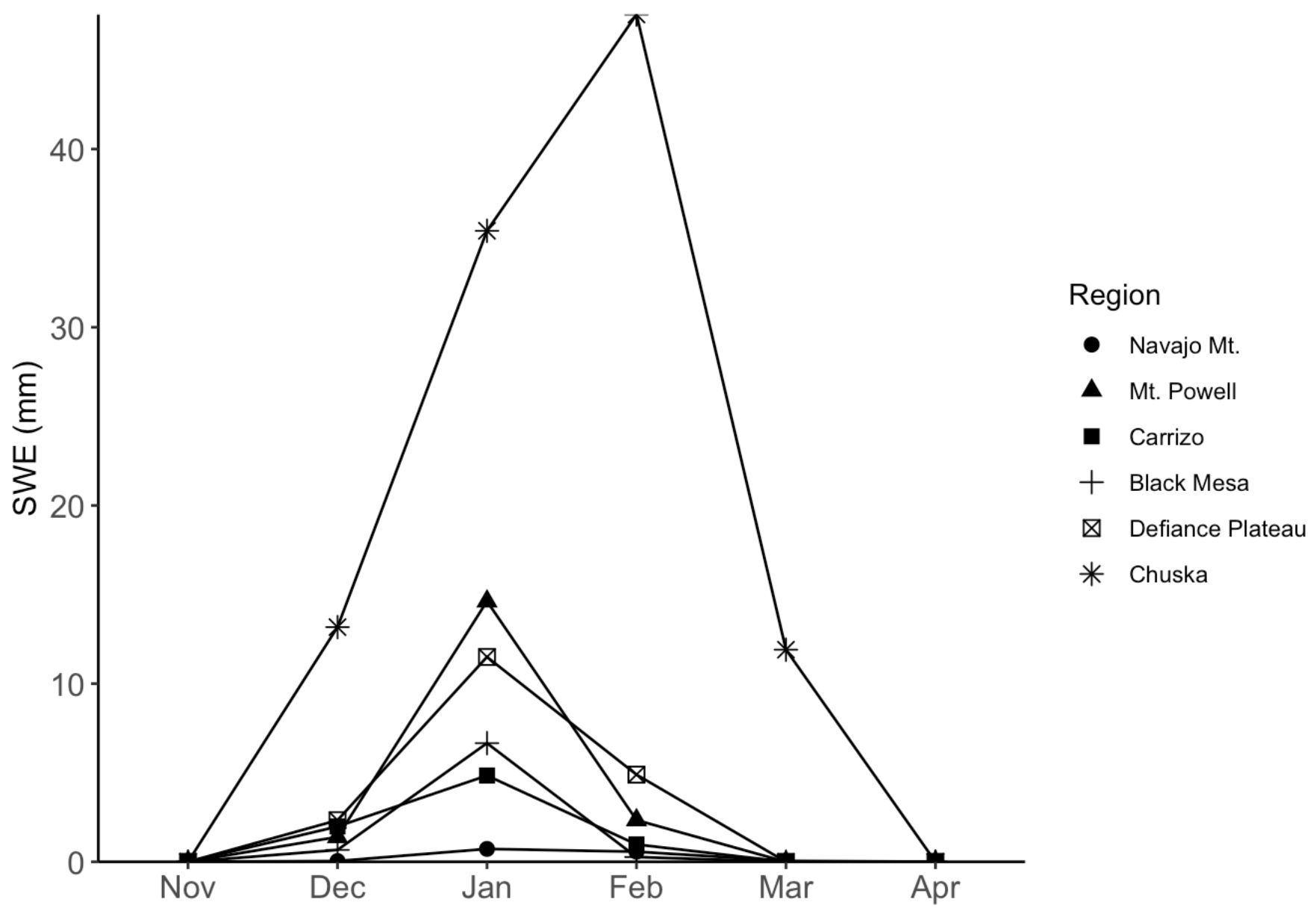
Black Mesa to Mt. Powell, Black Mesa to Defiance Plateau and Defiance Plateau and Mt Powell all have the highest correlations between each other - Least correlated are Black Mesa and Navajo Mt, Navajo Mt and Mt Powell, Navajo Mt and Defiance Plateau

Monthly Median

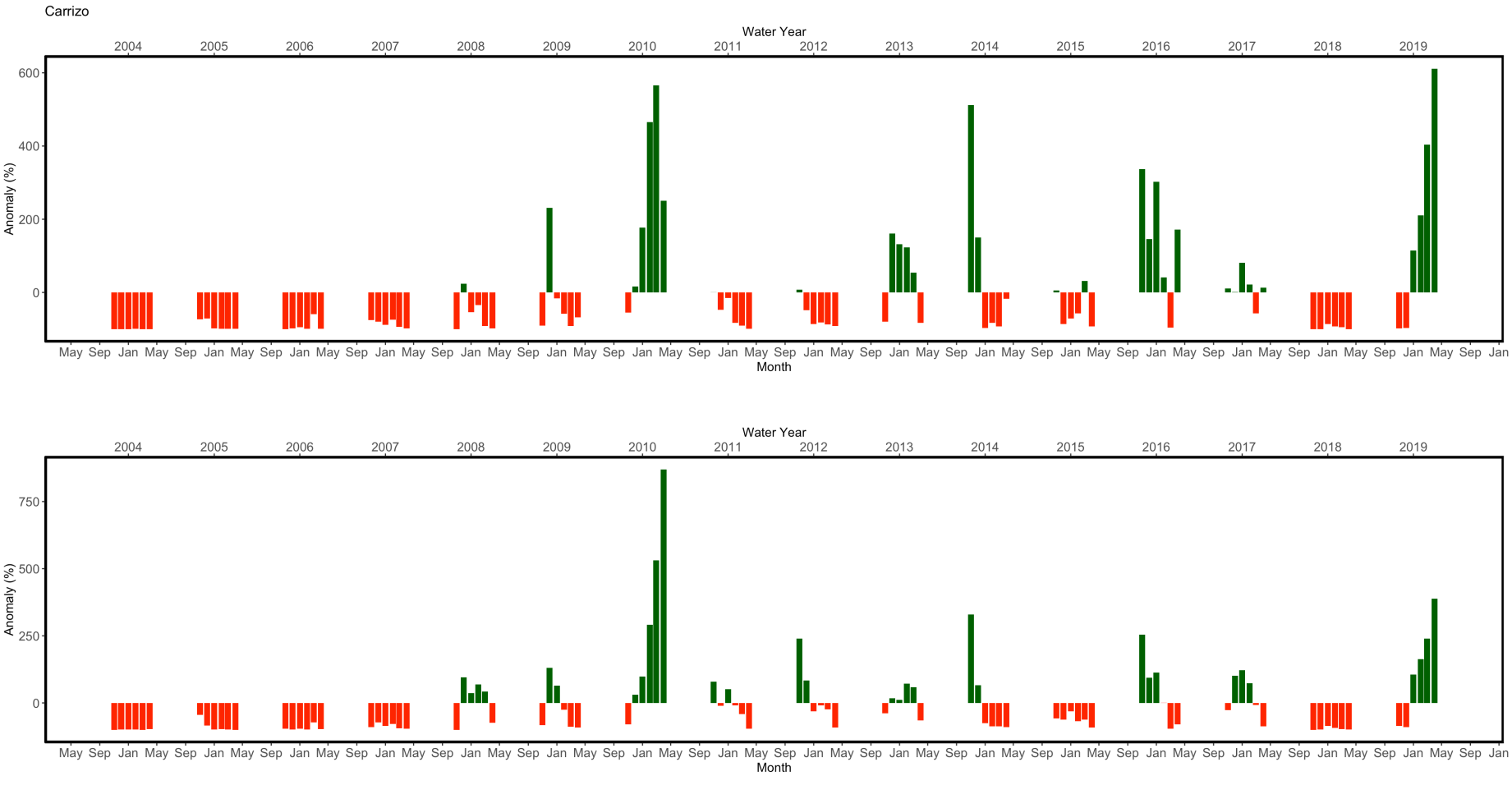


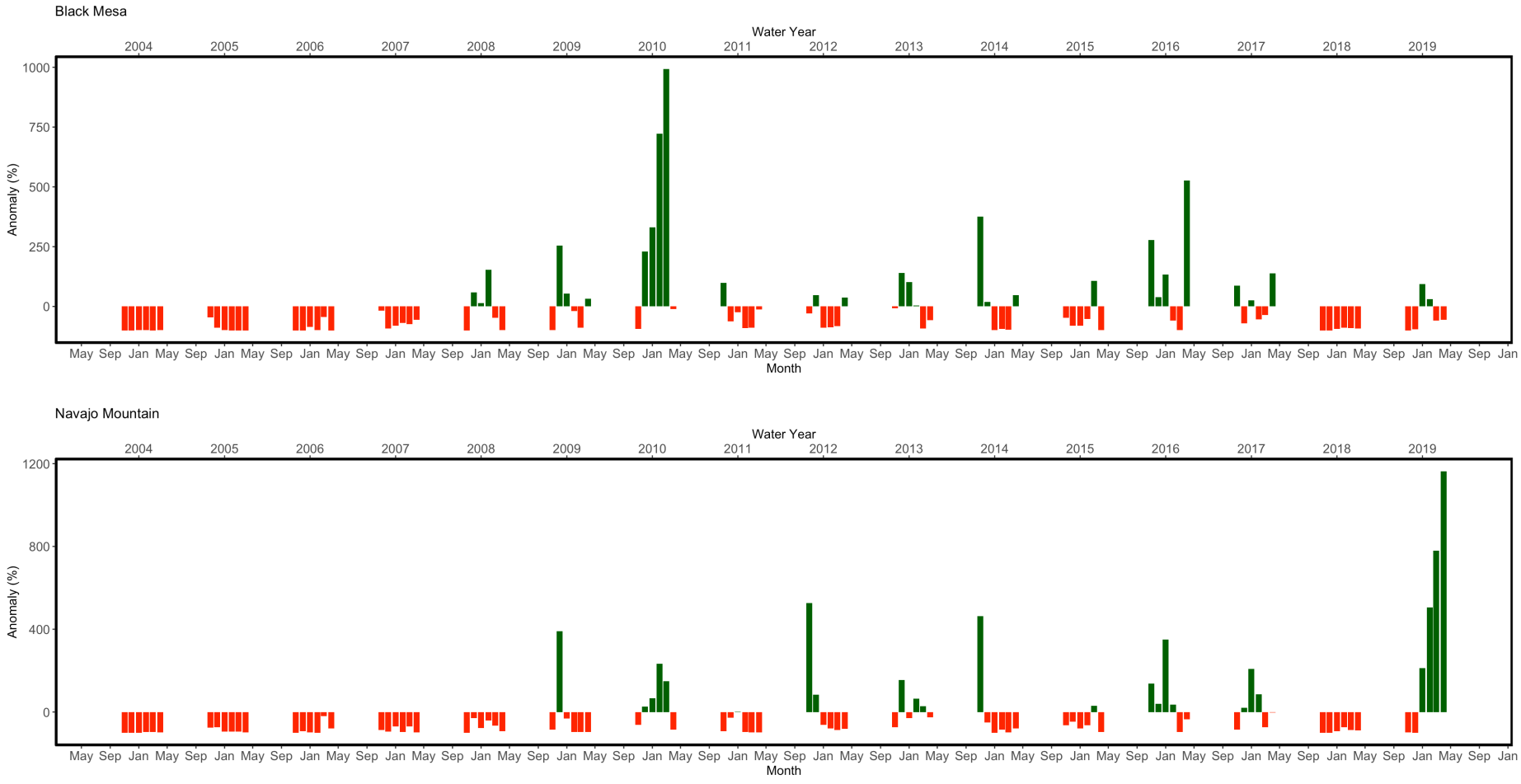
Chuska


Water Year
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
SWE (mm)
0 100 200
Apr Jul Oct Jan Apr Jul Oct Jan Apr Jul Oct Jan



Monthly Anomalies (November - April Water Year)





Correlations Between locations

Weekly mean correlation November - April

Pearson’s Correlation R squared:

- Chuska vs Black Mesa: 0.46
- Carrizo vs Chuska: 0.63
- Carrizo vs Black Mesa: 0.73

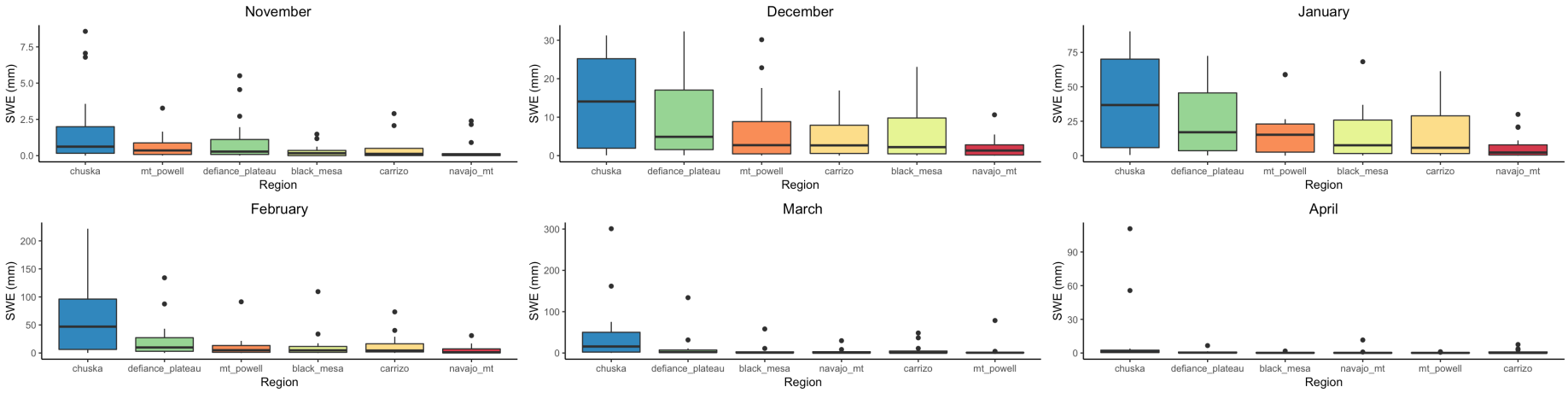
Chuska vs Black Mesa R squared: 0.4634808

Chuska vs Carrizo R squared: 0.631619

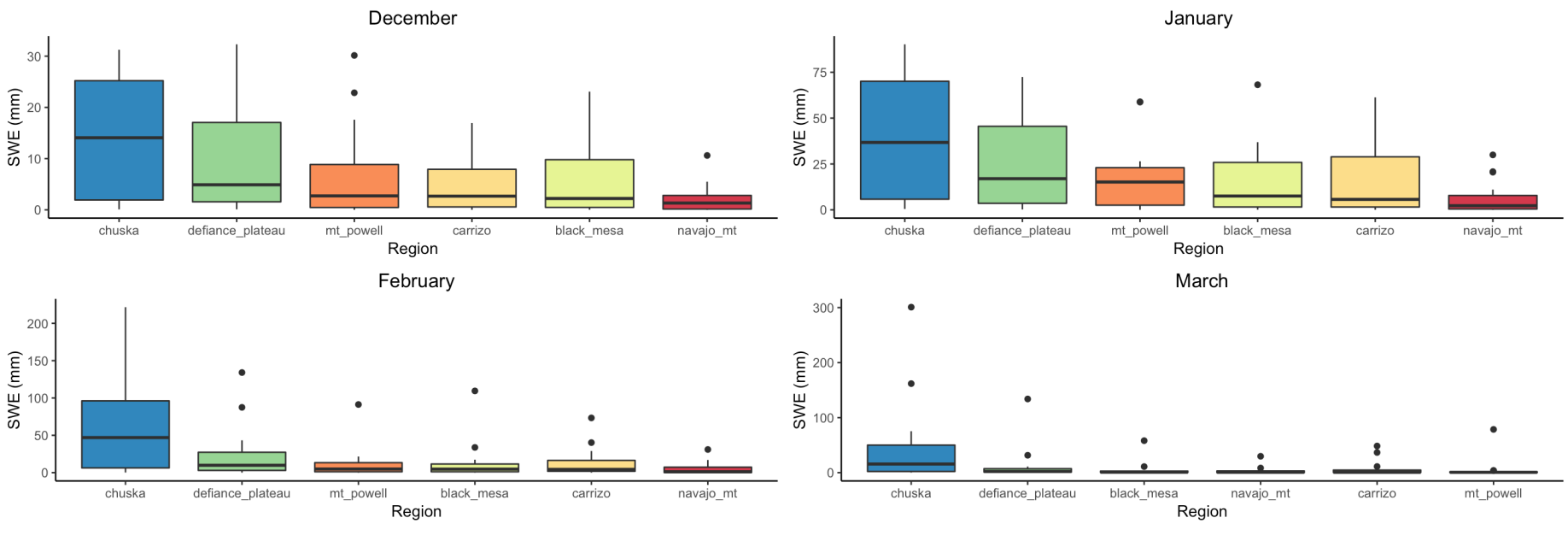
Black Mesa vs Carrizo R squared: 0.7250093

Month specific time series

November - April Averaged SWE values

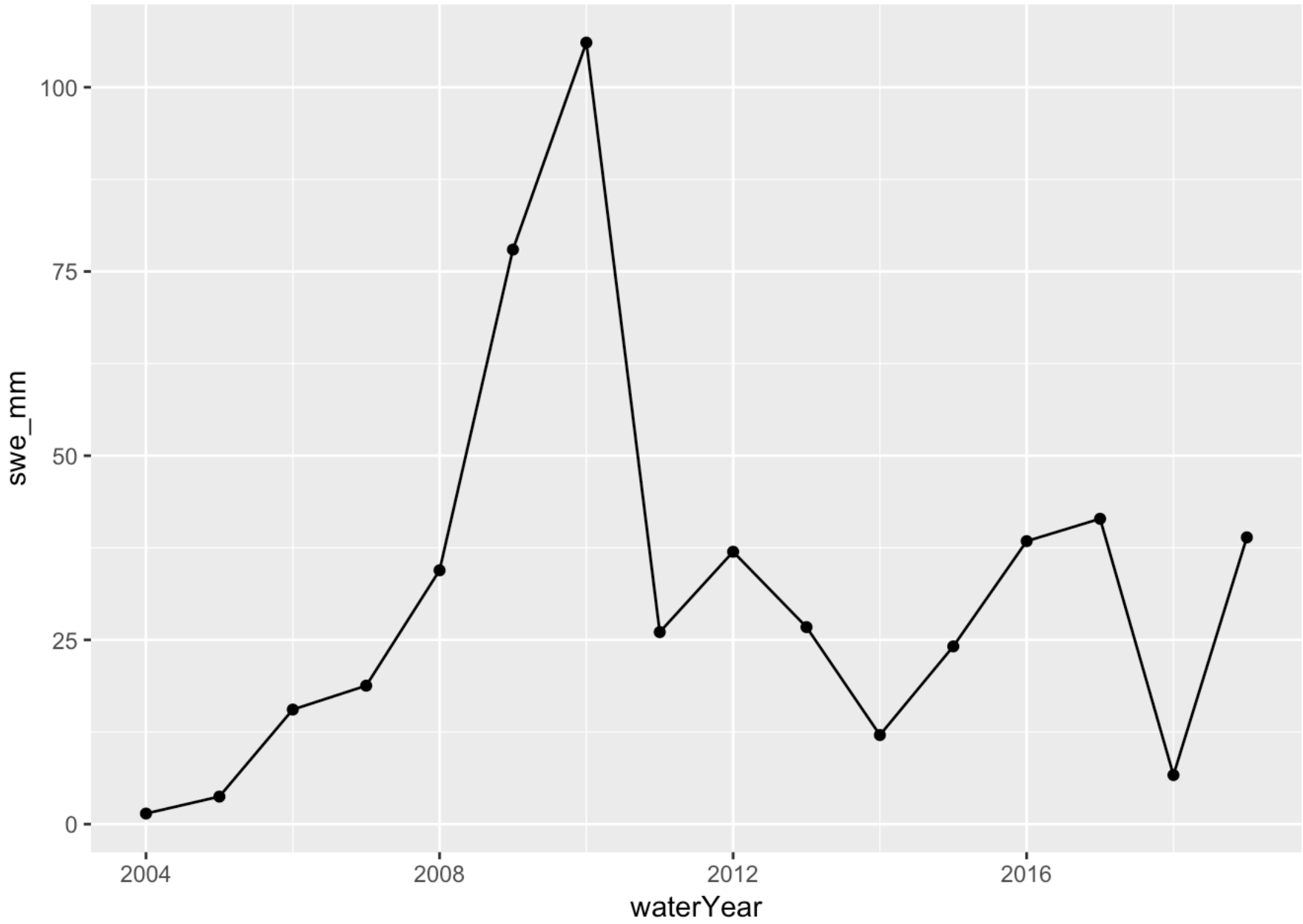


- Chuska and Defiance plateau frequently have the higest av swe values, navajo mt usually has the least.
- most everything is melted by april

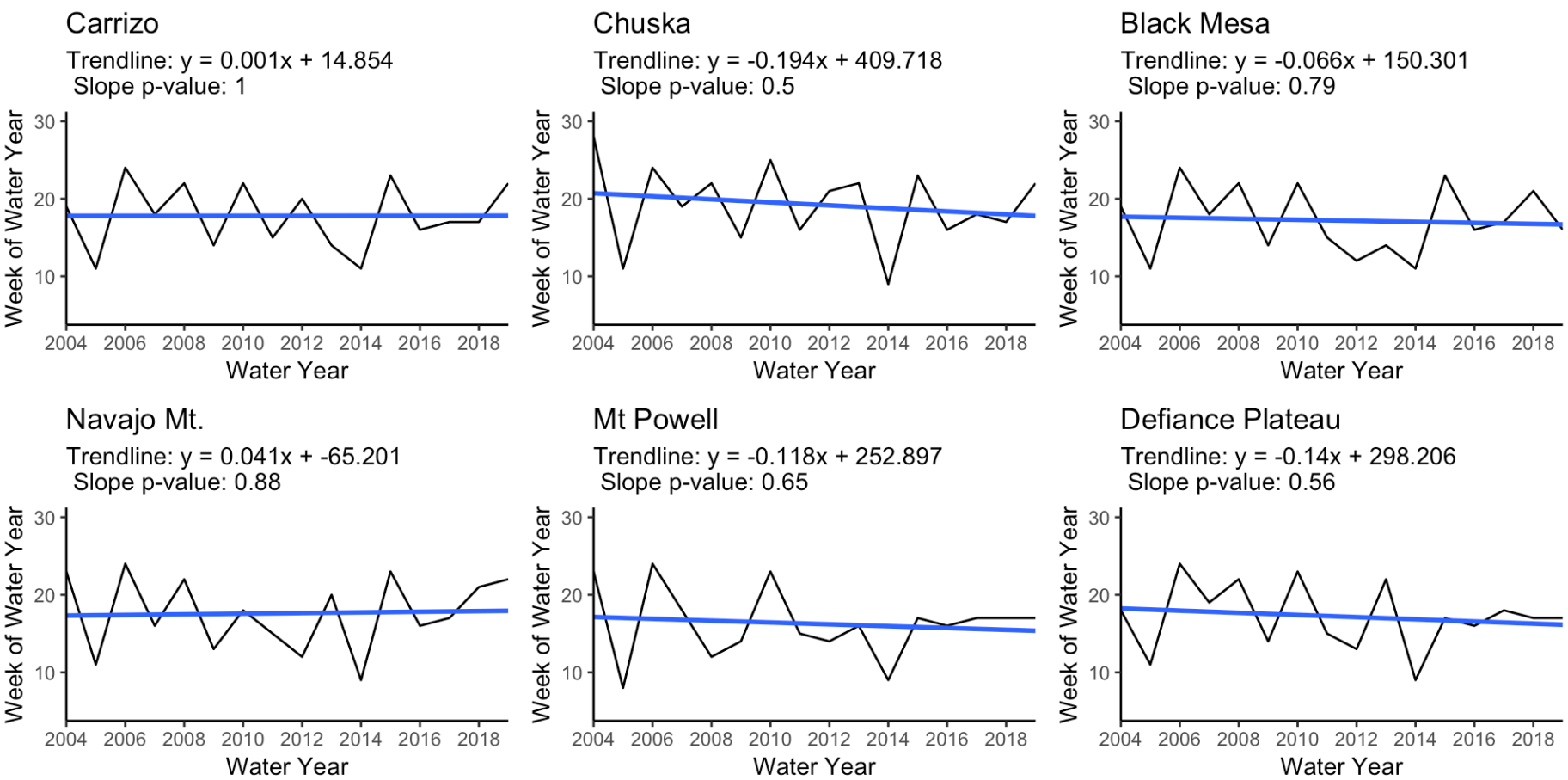


Total SWE for each region analyses

Timing of Max Weekly Average SWE Value

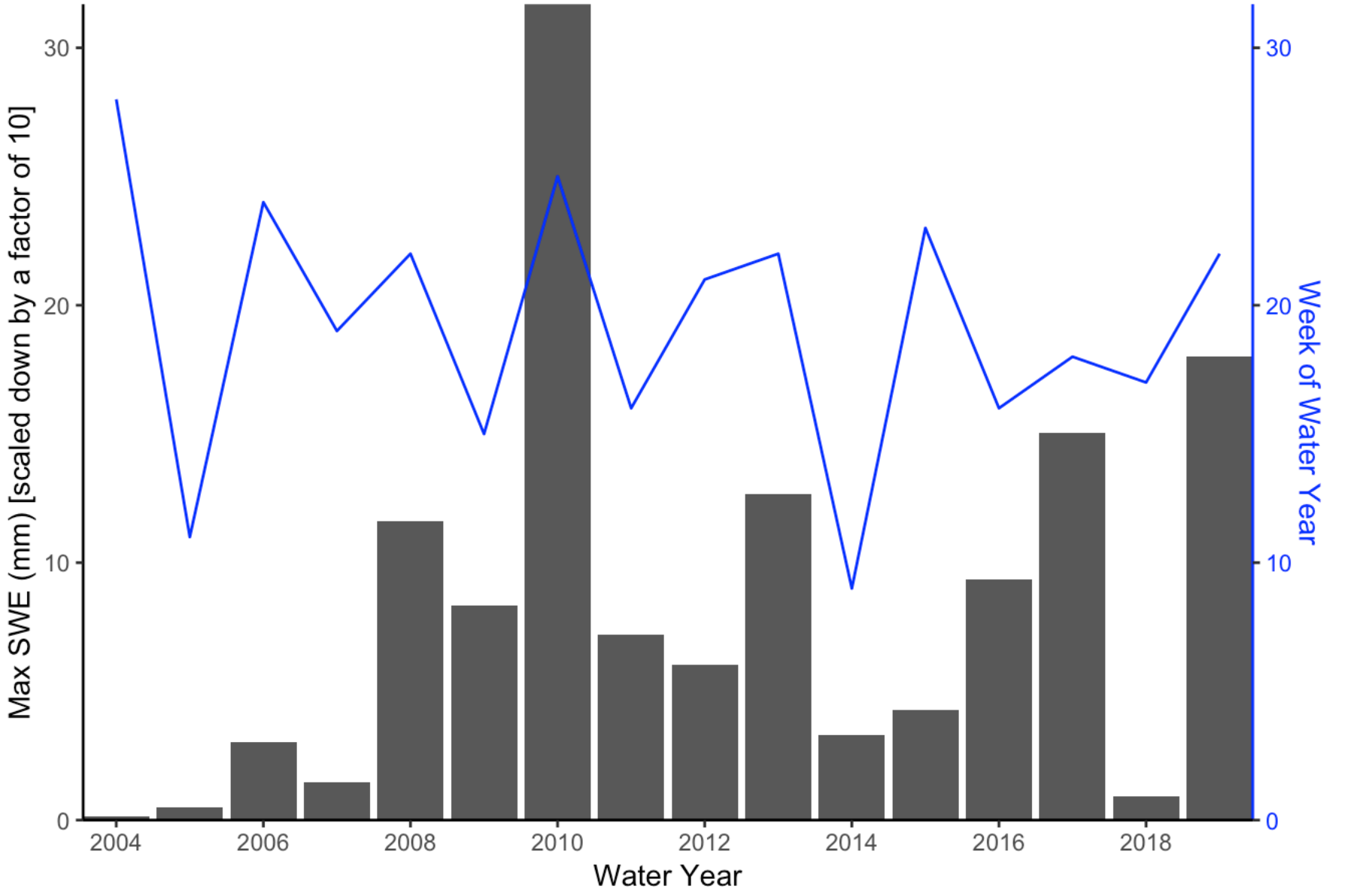



```
# what month does the max weeek usually occur for chuska?
mnth_mzx <- ch_max_weekly_yr %>%
  mutate(month = month(date)) %>%
  count(month) %>%
  mutate(perc = n/sum(n))
```



- All of the high elevation regions have a negative slope, with Chuska having the most negative slope, except Navajo Mt & Carrizo
- However, none of the trends are very statistically significant

Timing of Chuska Max Weekly Average SWE Value



SWE compared to Suzanne's SCA

```
## Error in .f(.x[[i]], ...): object 'water_year' not found
```

```
## Error in eval(lhs, parent, parent): object 'ch_sca_month' not found
```

```
## Error in eval(lhs, parent, parent): object 'ch_sca_month' not found
```

SCA Anomaly was scaled down by a factor of 10 to improve analysis

```
## Error in as.data.frame(y): object 'ch_sca_month' not found
```

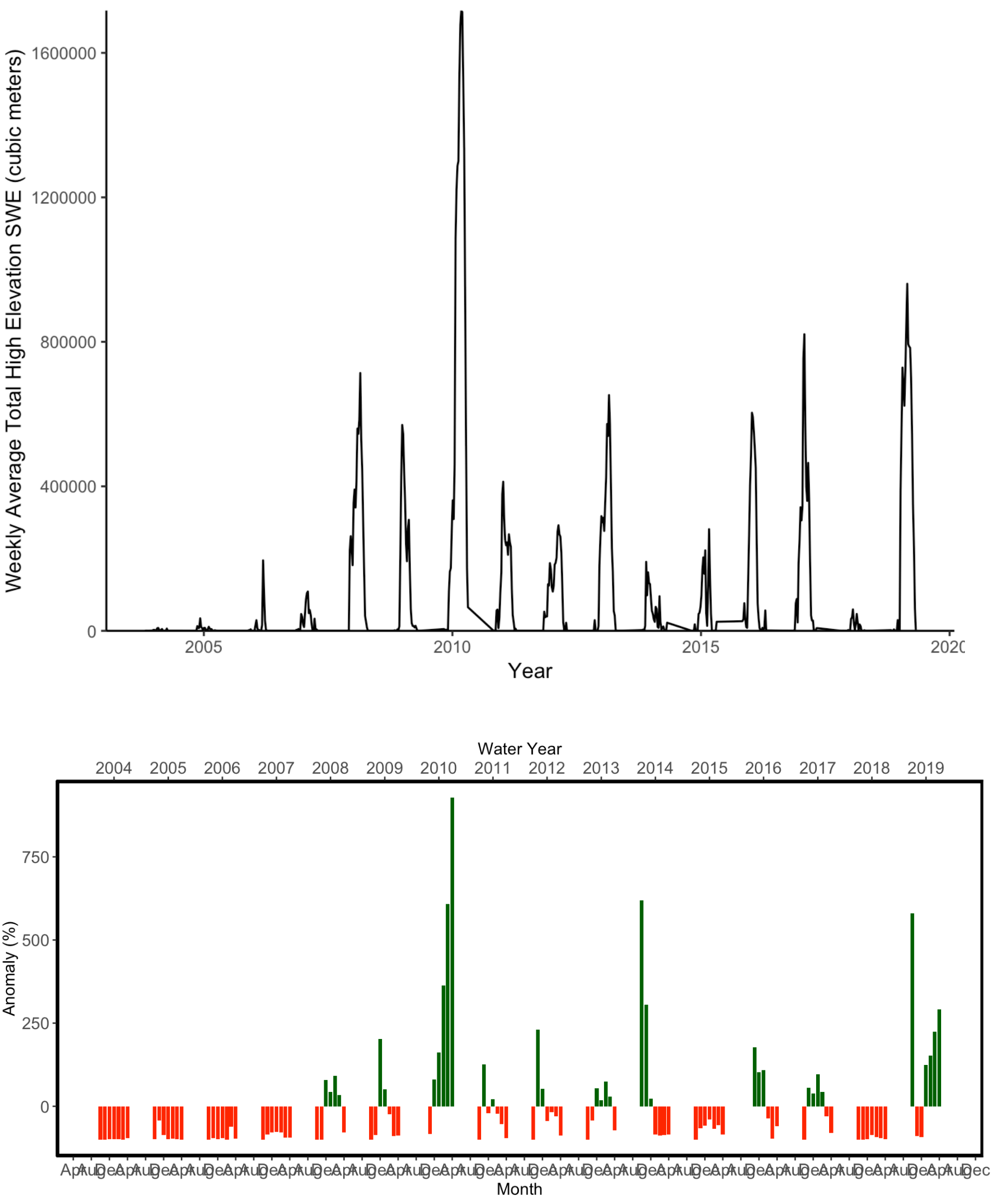
```
## Error in eval(lhs, parent, parent): object 'chuska_swe_sca' not found
```

```
## function (x, y, ...)
## UseMethod("plot")
## <bytecode: 0x7fb725396388>
## <environment: namespace:graphics>
```

- SCA anomalies only somewhat track to SWE anomalies

Make average weekly swe dataframe for all the mountain ranges combined

- first I am multiplying each region's swe values by their area
- then I will add these values up to get a total average amount of snow in the mountains for that week
- This way when I get an average value, it's the average amount of snow in the mountains at any one point


Weekly Average Total High Elevation SWE (cubic meters)
1600000
1200000
800000
400000
0
2005
2010
2015
2020
Year
Water Year
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Anomaly (%)
750
500
250
0
Month