AJAE appendix B for: Agricultural Insurance Loss and Relationships to Climate across the Inland Pacific Northwest Region of the United States

The material contained herein is supplementary to the article named in the title and published in the American Journal of Agricultural Economics (AJAE).

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Appendix B documents supplemental Principle Components Analyses (PCA) for the Pacific Northwest (PNW) and the inland Pacific Northwest (iPNW), to better understand the combined effects of differing damage causes, commodities, counties, and years on overall loss.

1. Supplemental Pacific Northwest (PNW) Principle Components Analysis In this section we outline a multitude of PCA outputs for the entire three state Pacific Norwest region (Oregon, Idaho, and Washington).

2. Supplemental Inland Pacific Northwest(iPNW) Principle Components Analysis Here we outline a multitude of PCA outputs for the 24 county iPNW Pacific Norwest region.

Figure List

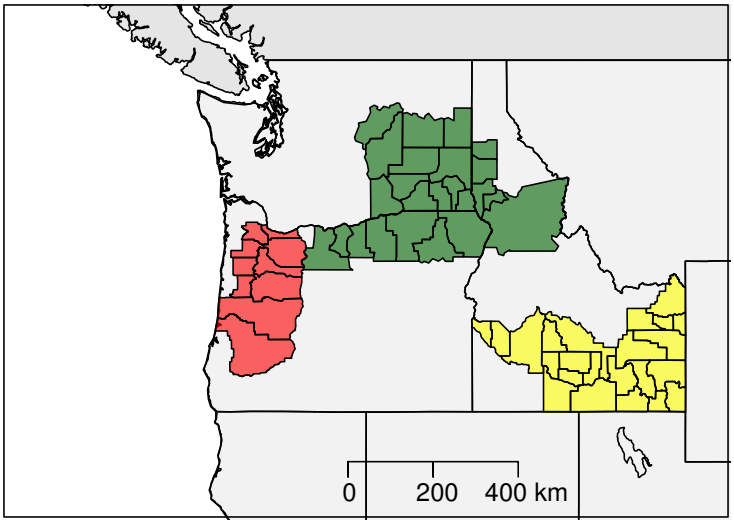


Figure 1: Pacific Northwest study area, which includes agricultural regions for the inland Pacific Northwest, the southern Idaho valley, and the Willamette valley.

Step 2d. PCA: PNW insurance loss, by MONTH with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the entire PNW, for all commodities by month, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

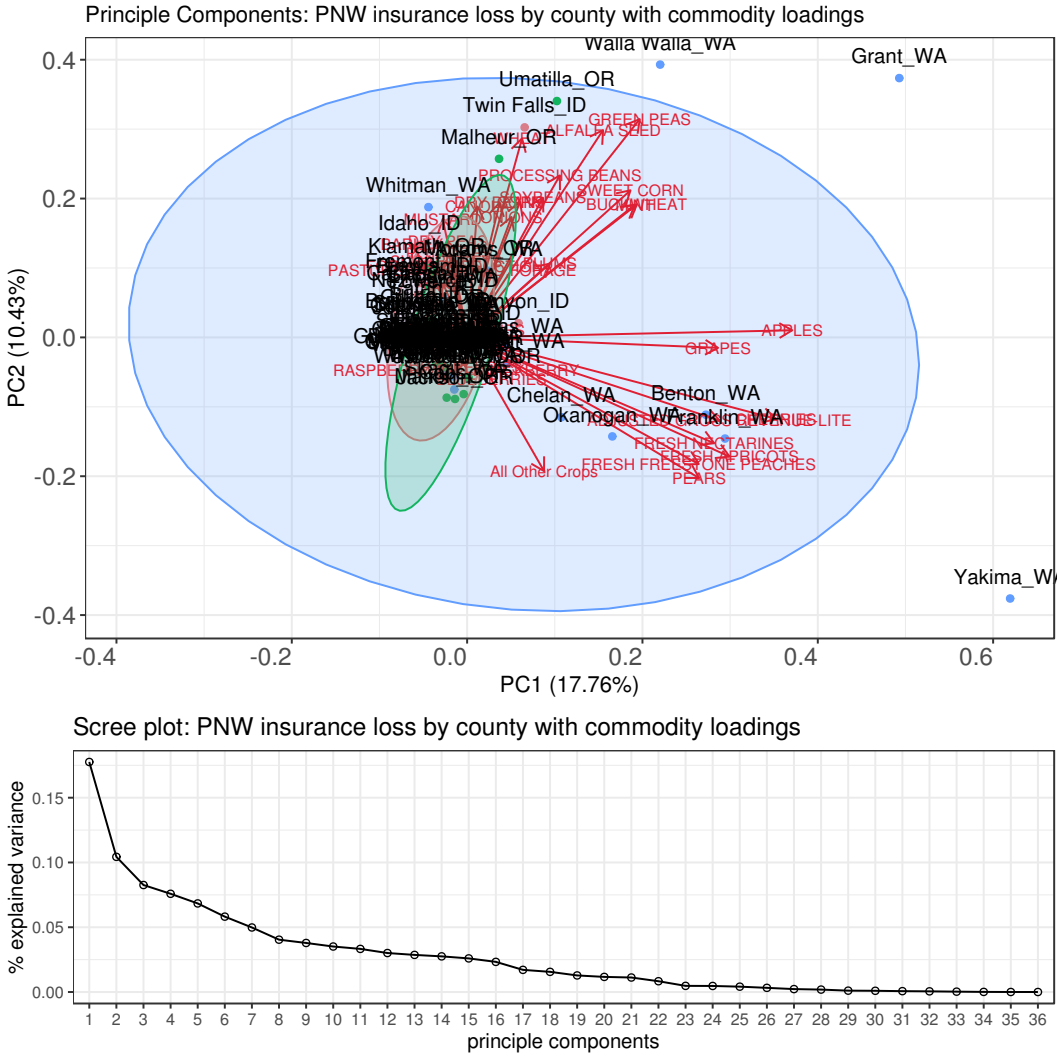


Figure 2: Top panel: Biplot of principle components for insurance loss for the entire PNW, by county, with commodity as the factor loadings. Bottom panel: Scree plot. Data from 2001 to 2015 is used.

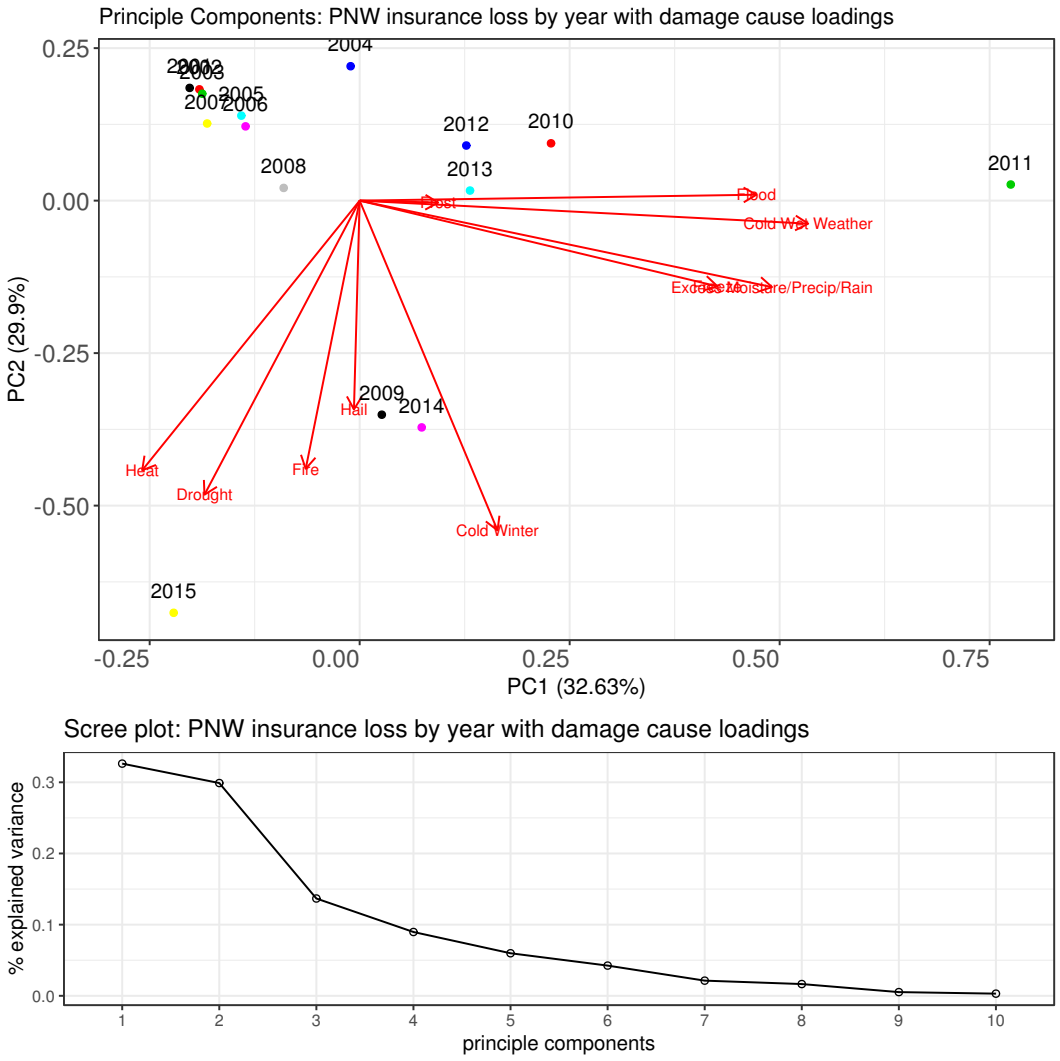


Figure 3: Top panel: biplot of principle components of insurance loss, for the entire PNW, for all commodities by year, with damage cause as the factor loadings. Bottom panel: Scree plot. Data from 2001 to 2015 is used.

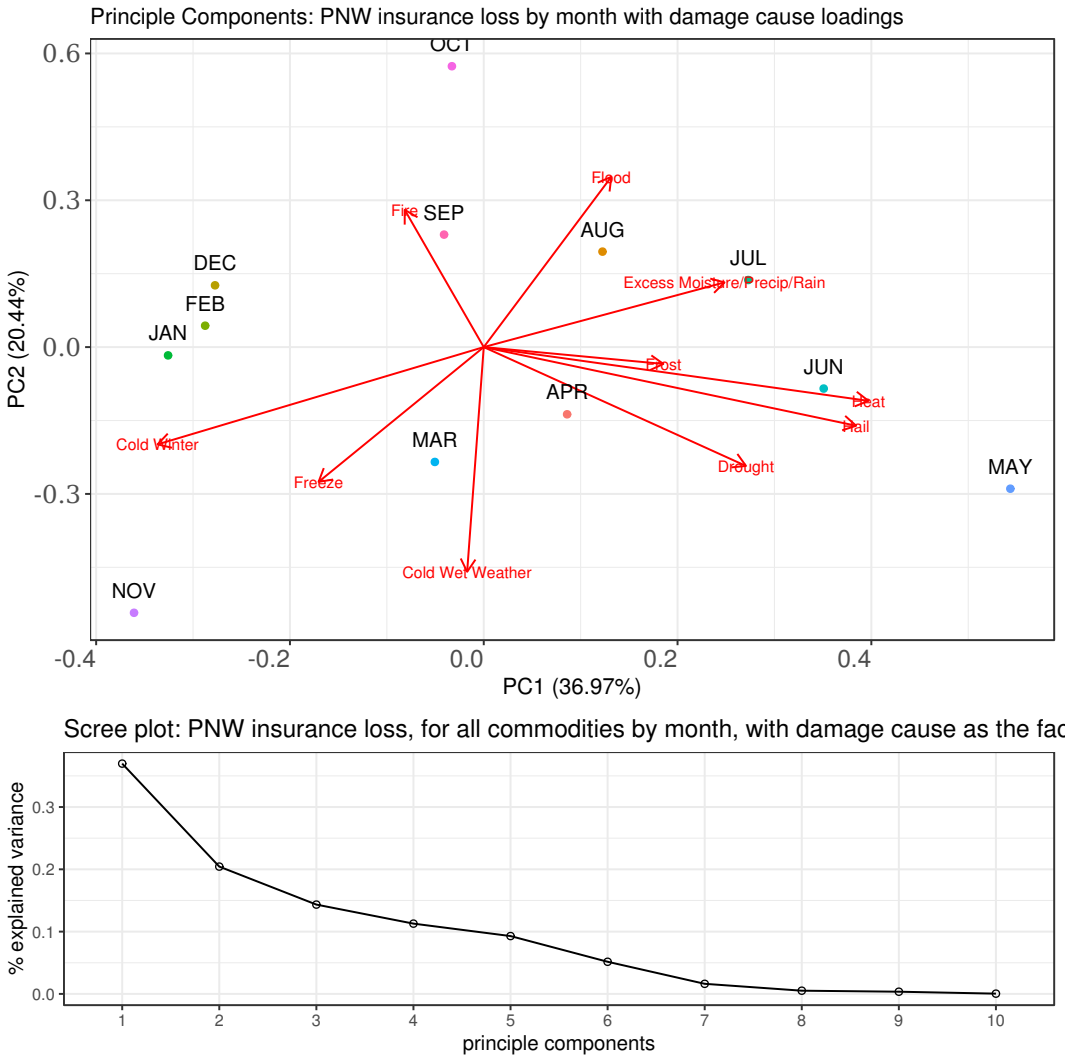


Figure 4: Top panel: biplot of principle components for insurance loss for the entire PNW, for all commodities by month, with damage cause as the factor loadings. Bottom panel: Scree plot Data from 2001 is 2015 is used.

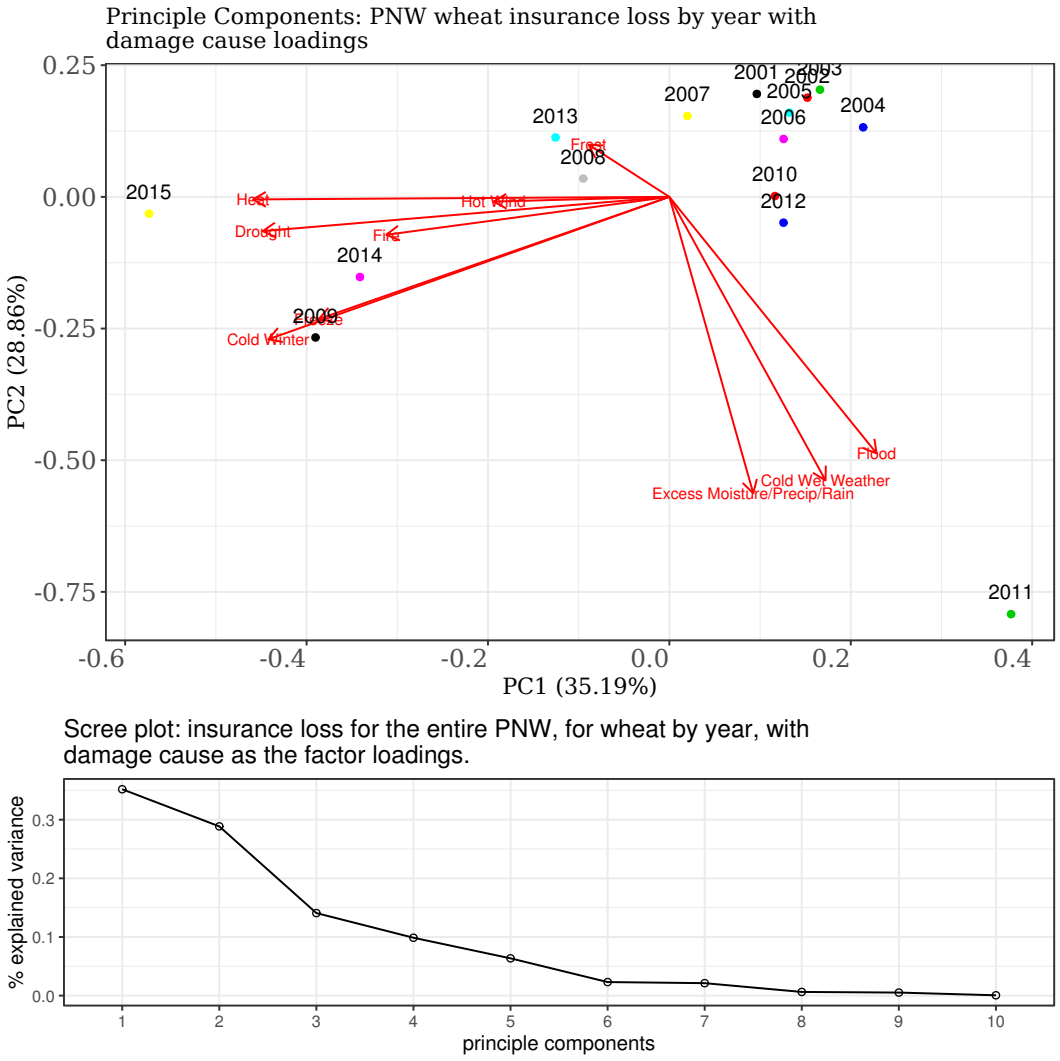


Figure 5: Top panel: insurance loss for the entire PNW, for wheat by year, with damage cause as the factor loadings. Bottom panel: Scree plot. Data from 2001 is 2015 is used.

Step 2f. PCA: PNW WHEAT insurance loss, by COUNTY with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the entire PNW, for wheat by county, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

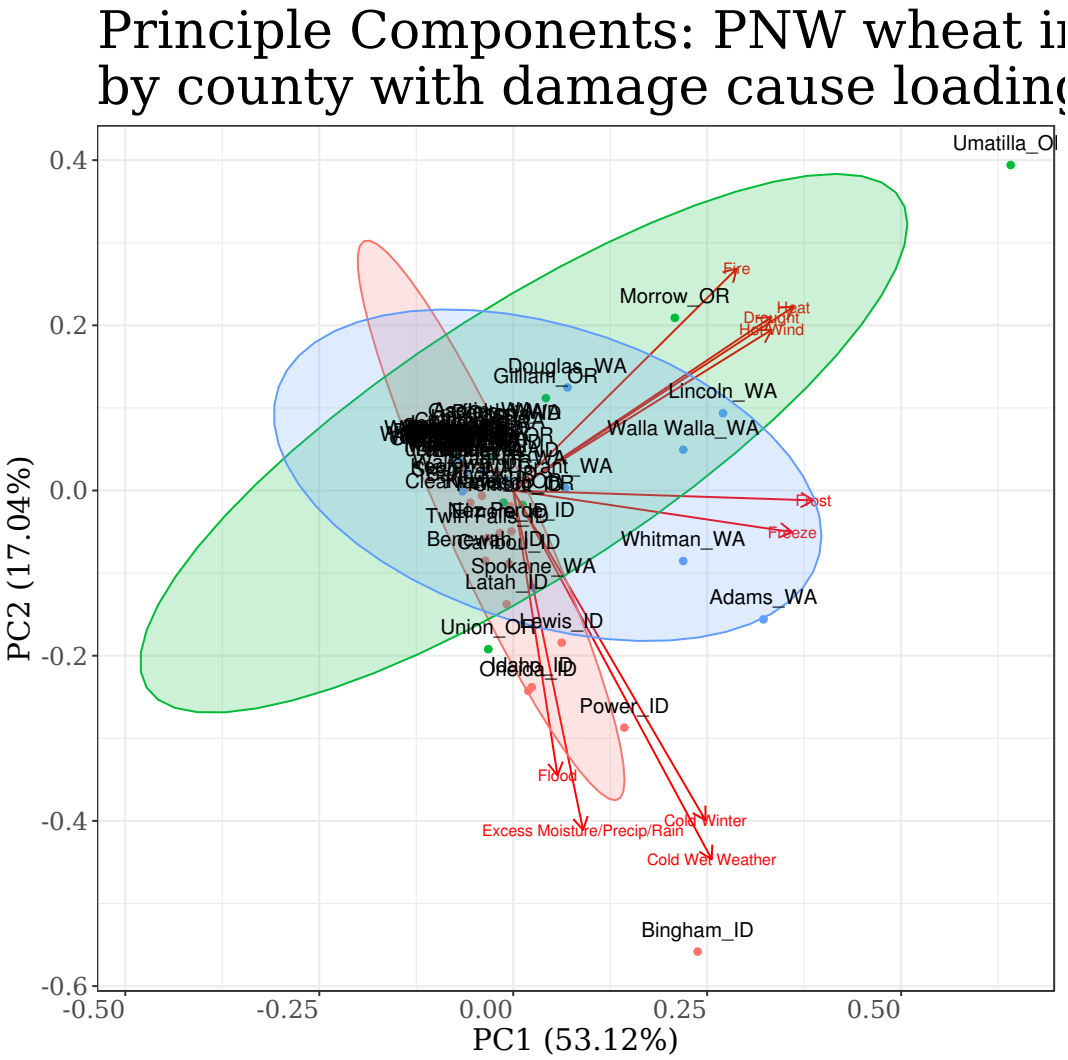


Figure 6: Your caption.

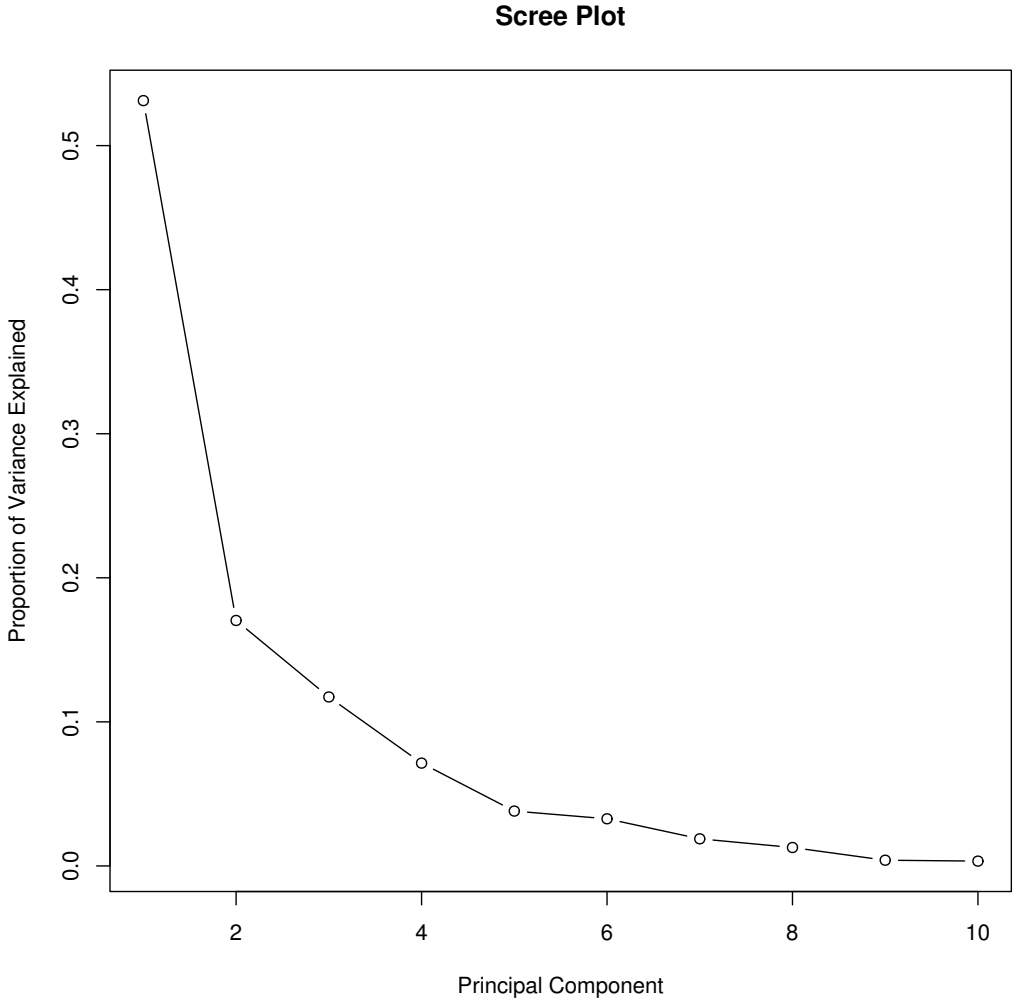


Figure 7: Your caption.

Step 2g. PCA: PNW APPLES insurance loss, by COUNTY with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the entire PNW, for apples by county, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

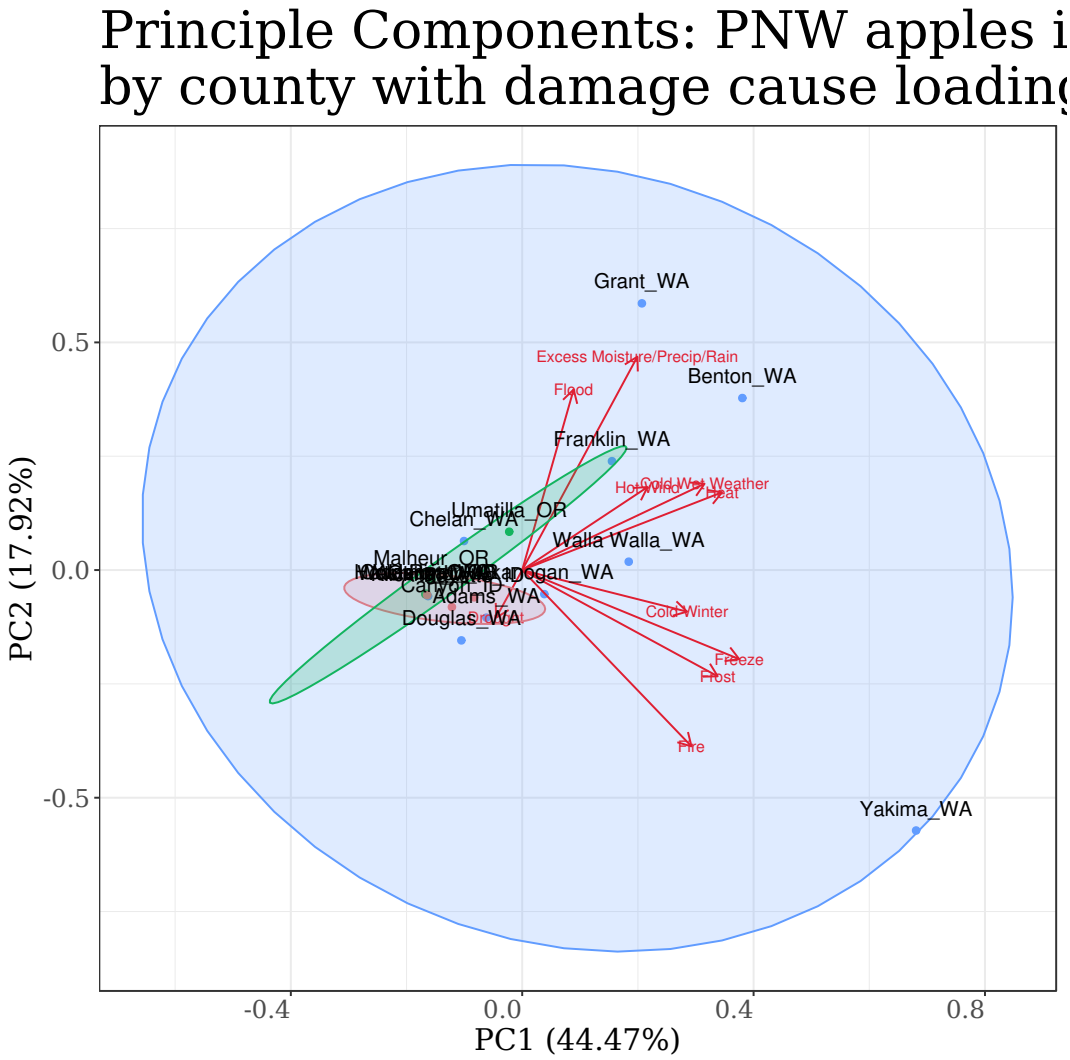


Figure 8: Your caption.

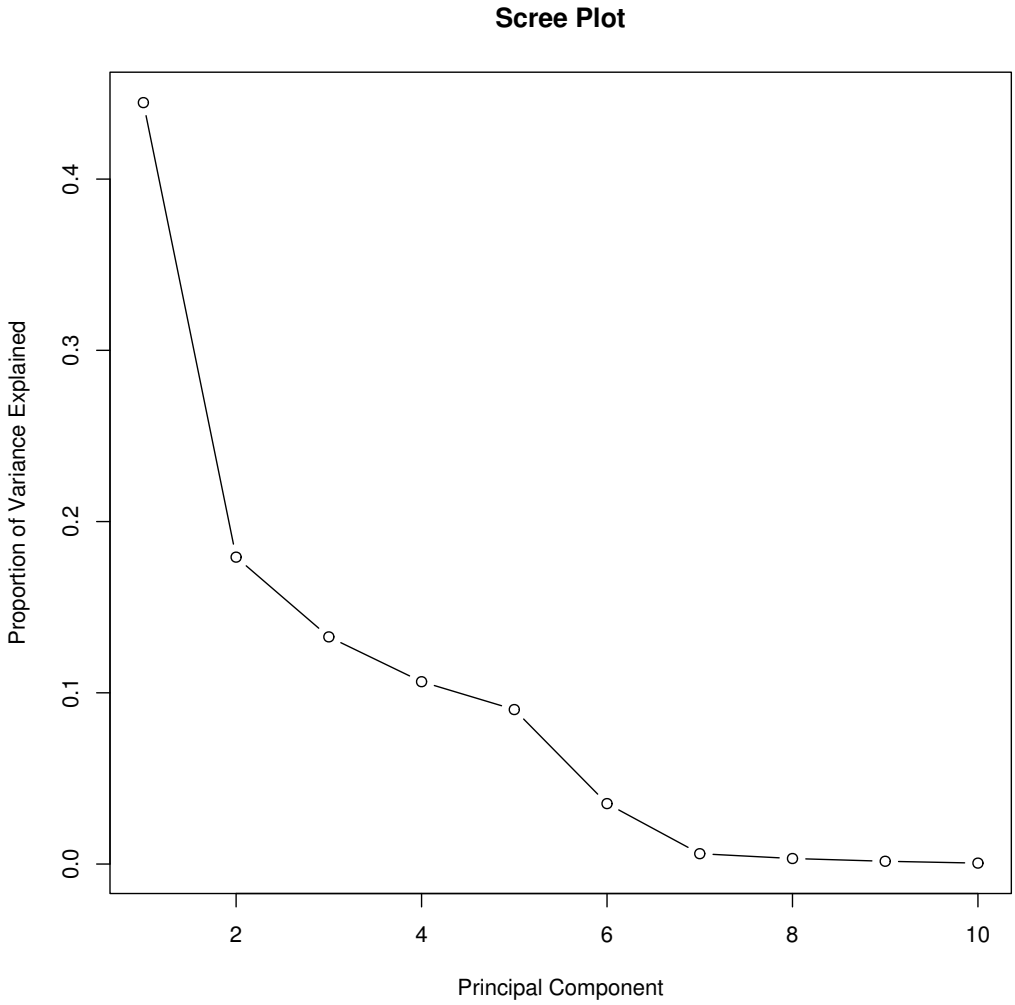


Figure 9: Your caption.

Step 2h. PCA: PNW BARLEY insurance loss, by COUNTY with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the entire PNW, for barley by county, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

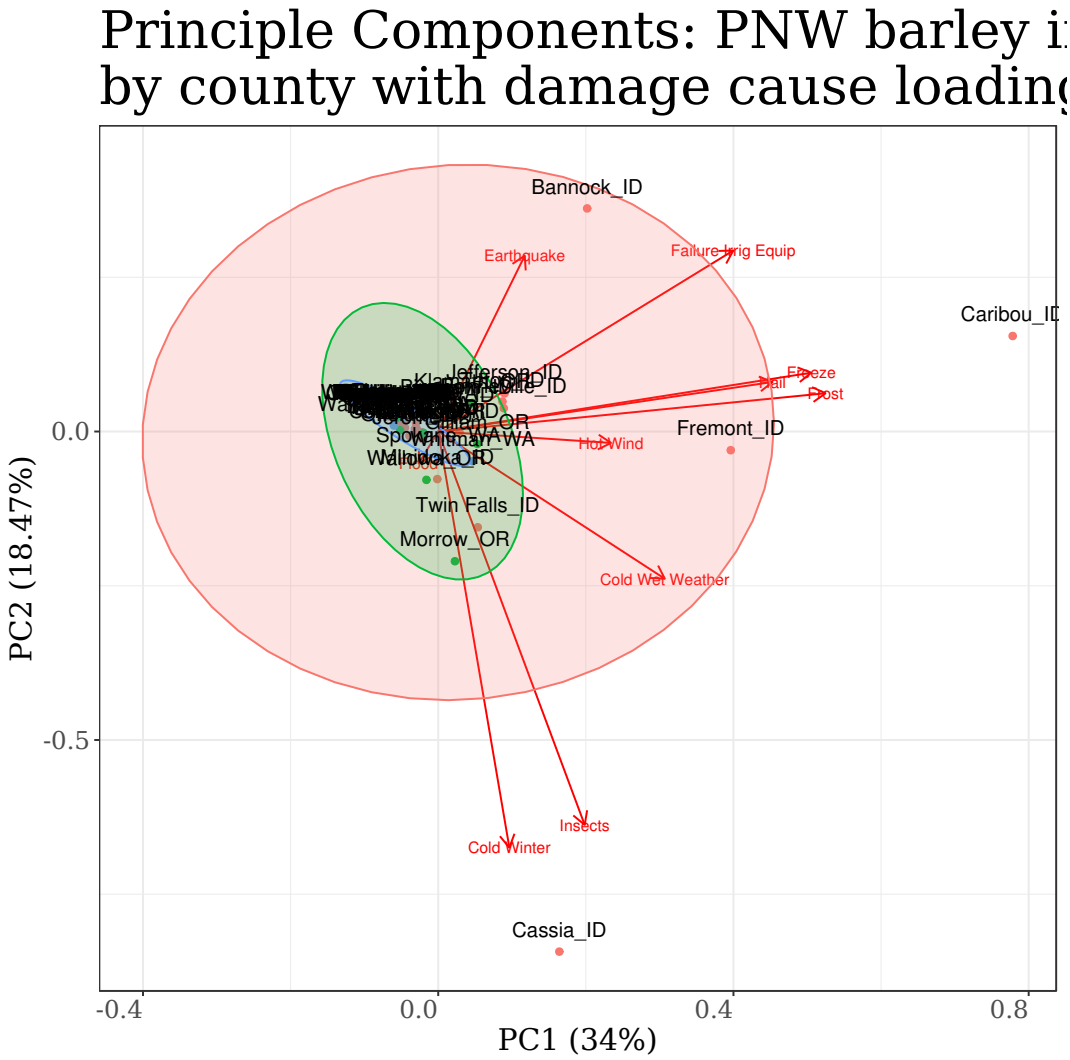


Figure 10: Your caption.

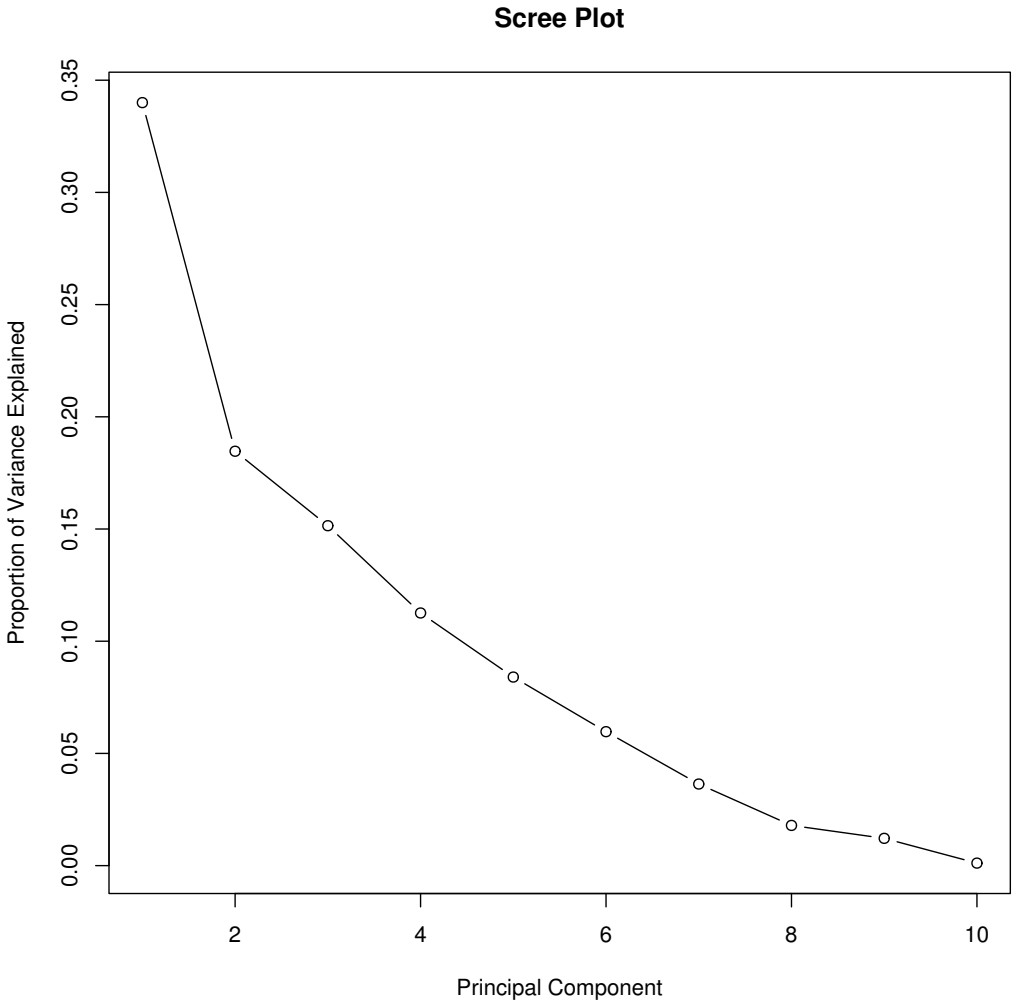


Figure 11: Your caption.

Step 3. Inland Pacific Northwest(iPNW) PCA.

In step 3, we outline a multitude of PCA outputs for the 24 county iPNW Pacific Norwest region, including:

Step 3a. Inland Pacific Northwest (iPNW) Study Area

Here we document the 24 county iPNW study area.

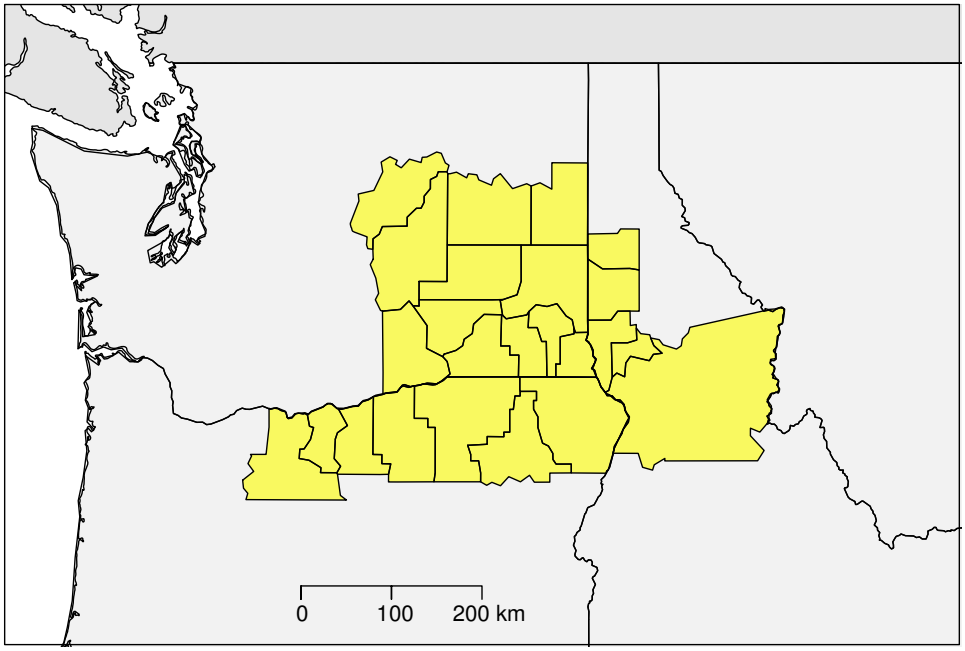


Figure 12: Your caption.

Step 3b. PCA: IPNW insurance loss by COUNTY with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the inland PNW, for all commodities by county, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

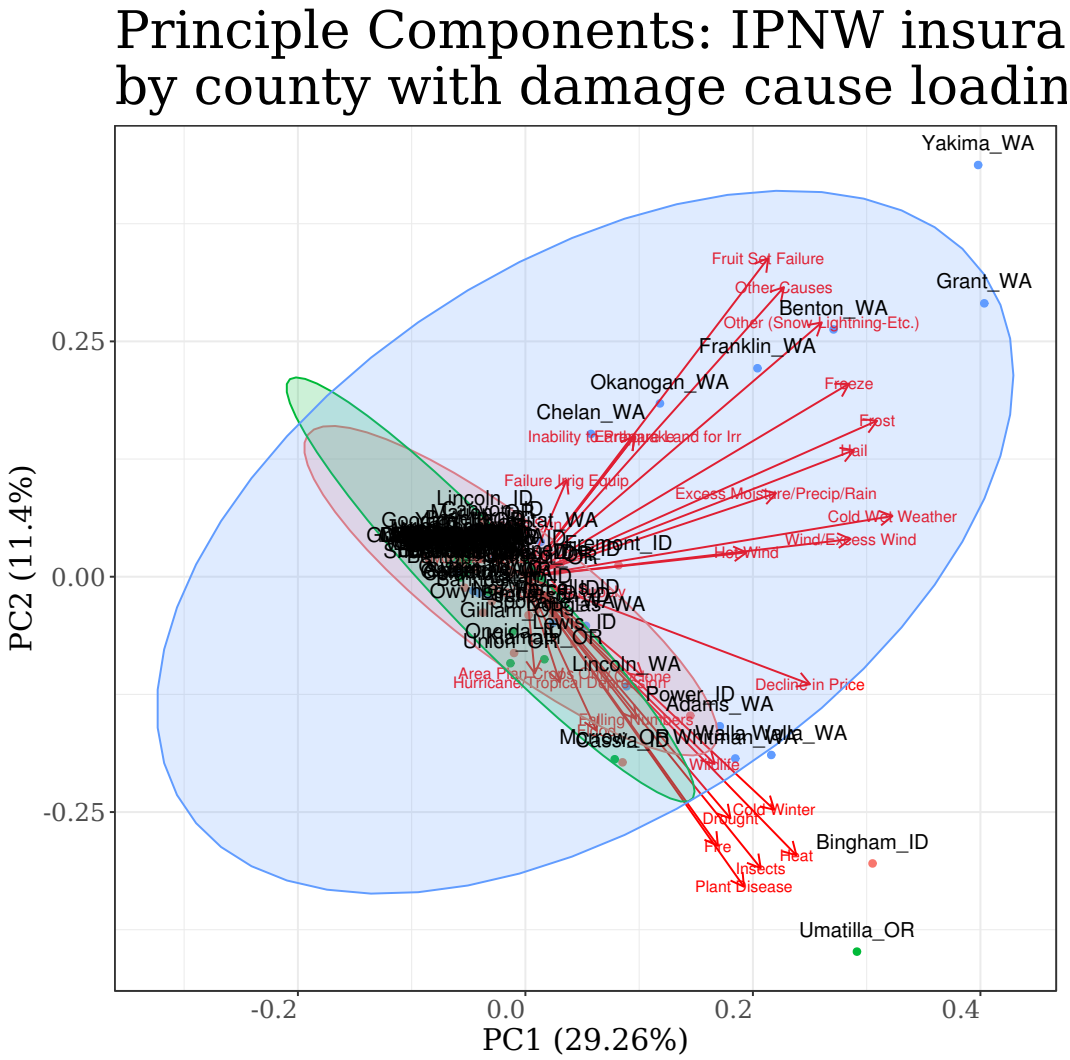


Figure 13: Your caption.

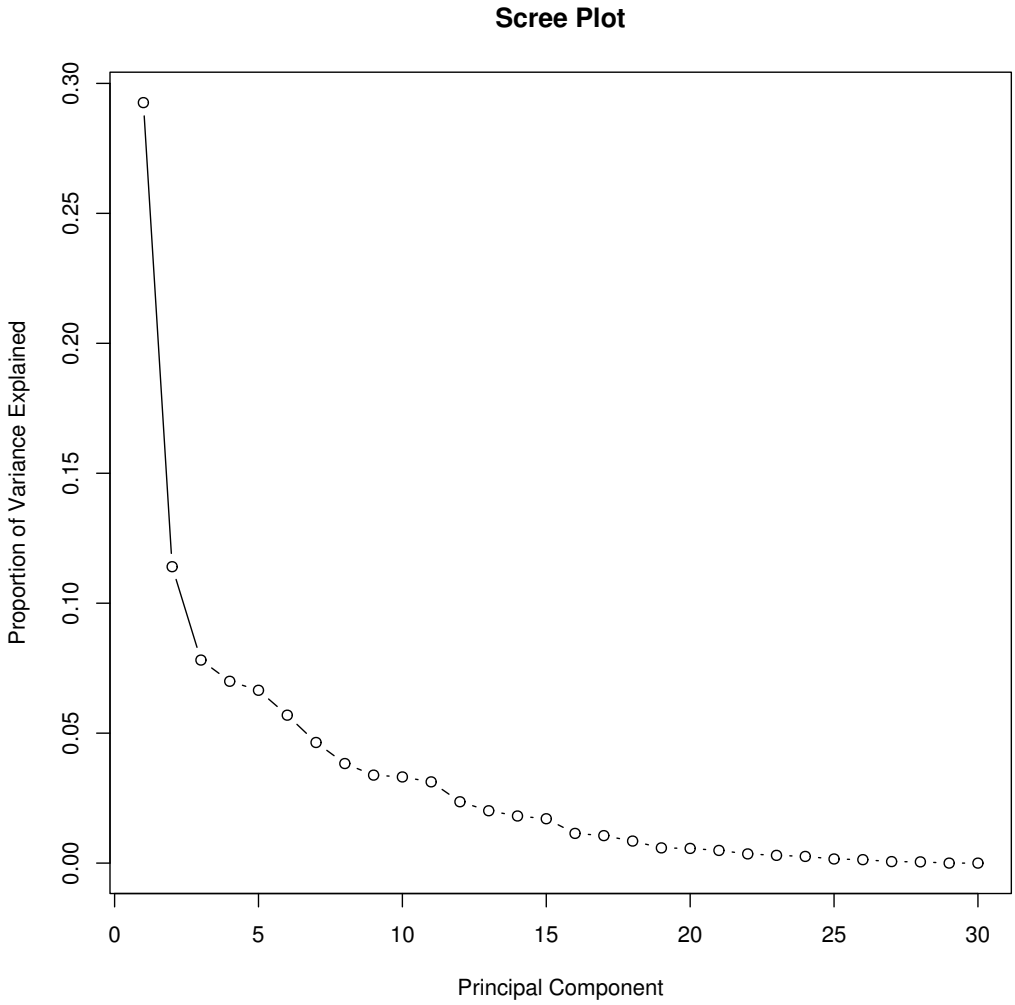


Figure 14: Your caption.

Step 3c. PCA + KMEANS: WHEAT IPNW insurance loss, by COUNTY with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the inland PNW, for wheat by county, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

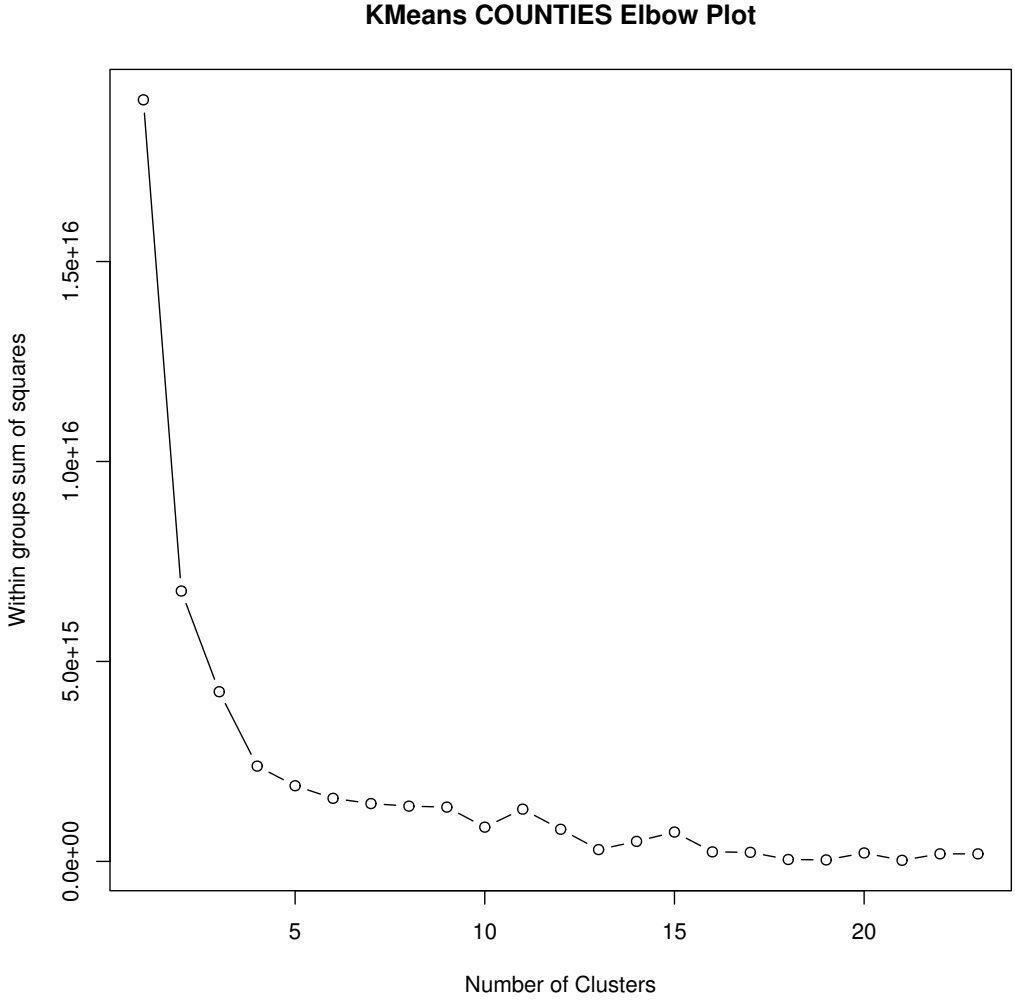
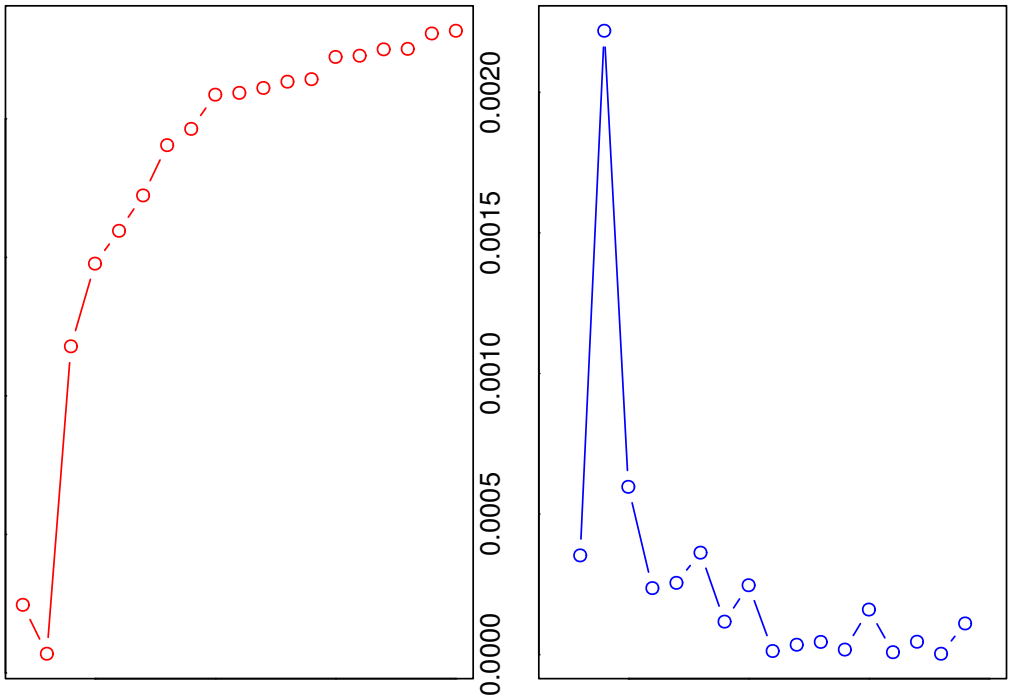
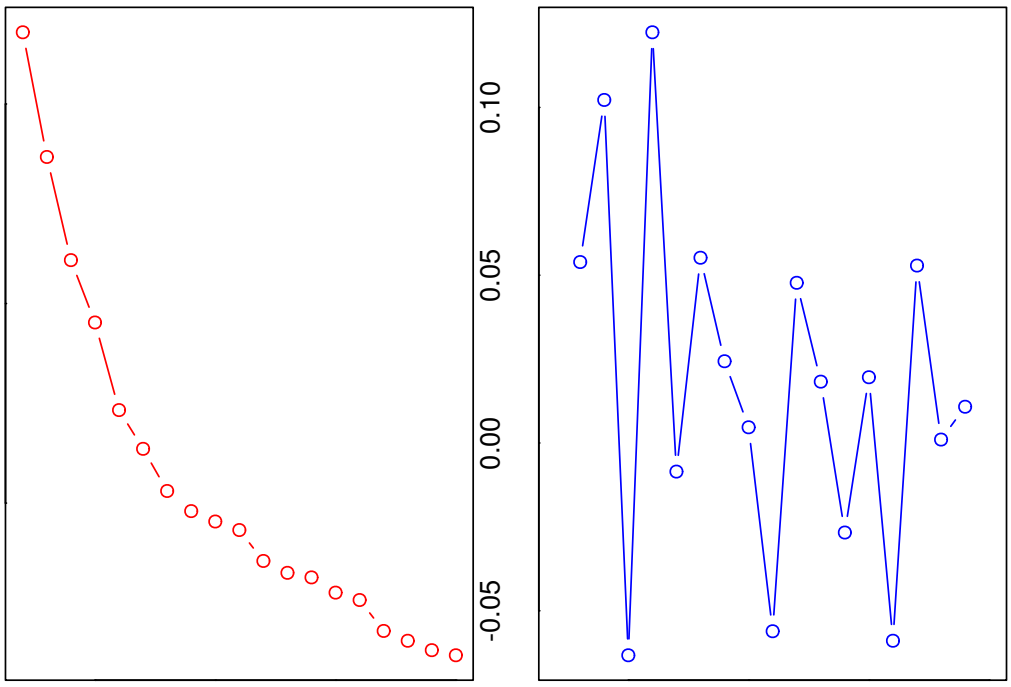


Figure 15: Your caption.




```
## *** : The Hubert index is a graphical method of determining the number of clusters.
##                 In the plot of Hubert index, we seek a significant knee that corresponds to a
##                 significant increase of the value of the measure i.e the significant peak in Hubert
##                 index second differences plot.
##
```



```
## *** : The D index is a graphical method of determining the number of clusters.
##                 In the plot of D index, we seek a significant knee (the significant peak in Dindex
##                 second differences plot) that corresponds to a significant increase of the value of
##                 the measure.
##
## *******************************************************************
## * Among all indices:
## * 6 proposed 2 as the best number of clusters
## * 4 proposed 3 as the best number of clusters
## * 2 proposed 4 as the best number of clusters
## * 2 proposed 6 as the best number of clusters
## * 1 proposed 7 as the best number of clusters
## * 2 proposed 8 as the best number of clusters
## * 3 proposed 17 as the best number of clusters
## * 1 proposed 19 as the best number of clusters
## * 3 proposed 20 as the best number of clusters
##
##                    ***** Conclusion *****
##
## * According to the majority rule, the best number of clusters is  2
##
##
## *******************************************************************
```

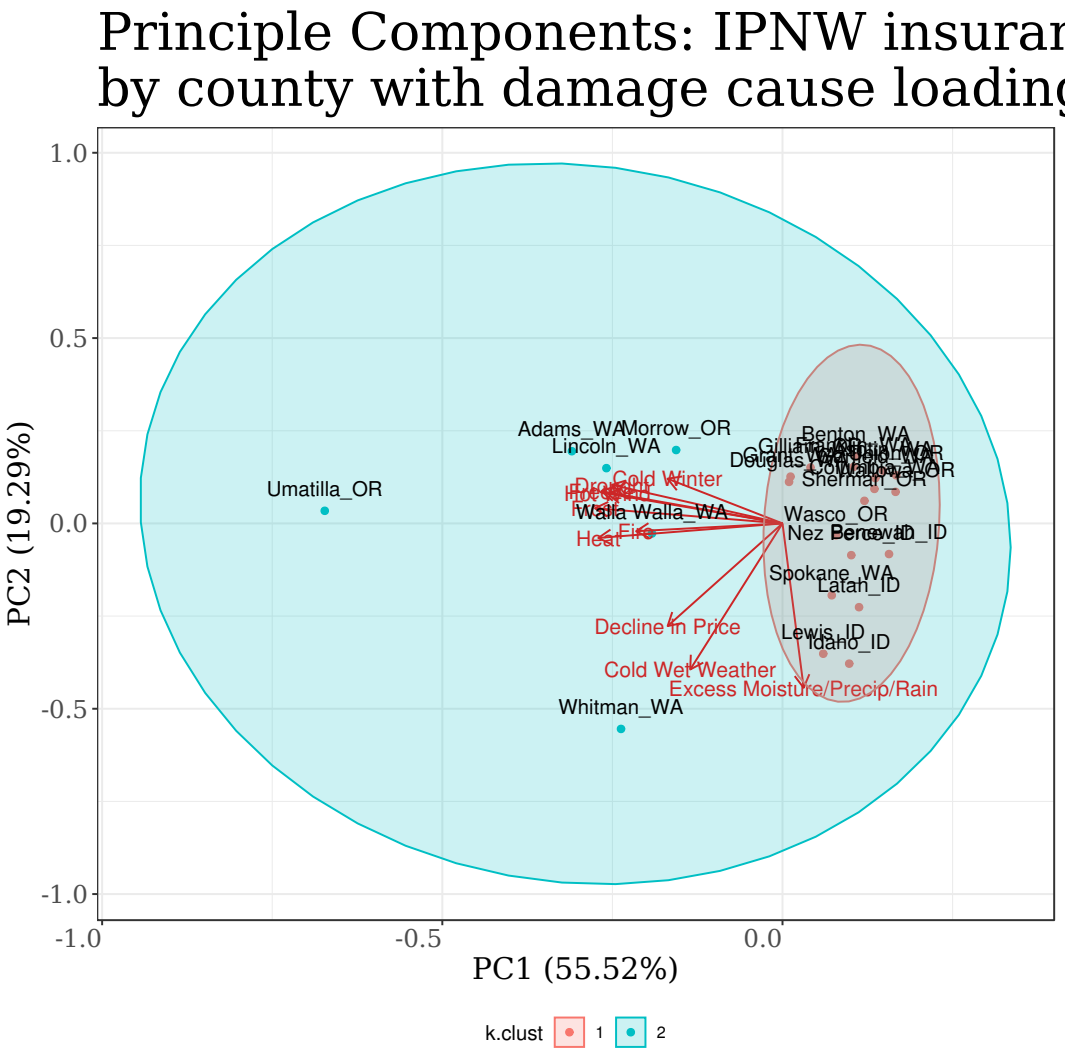


Figure 16: Your caption.

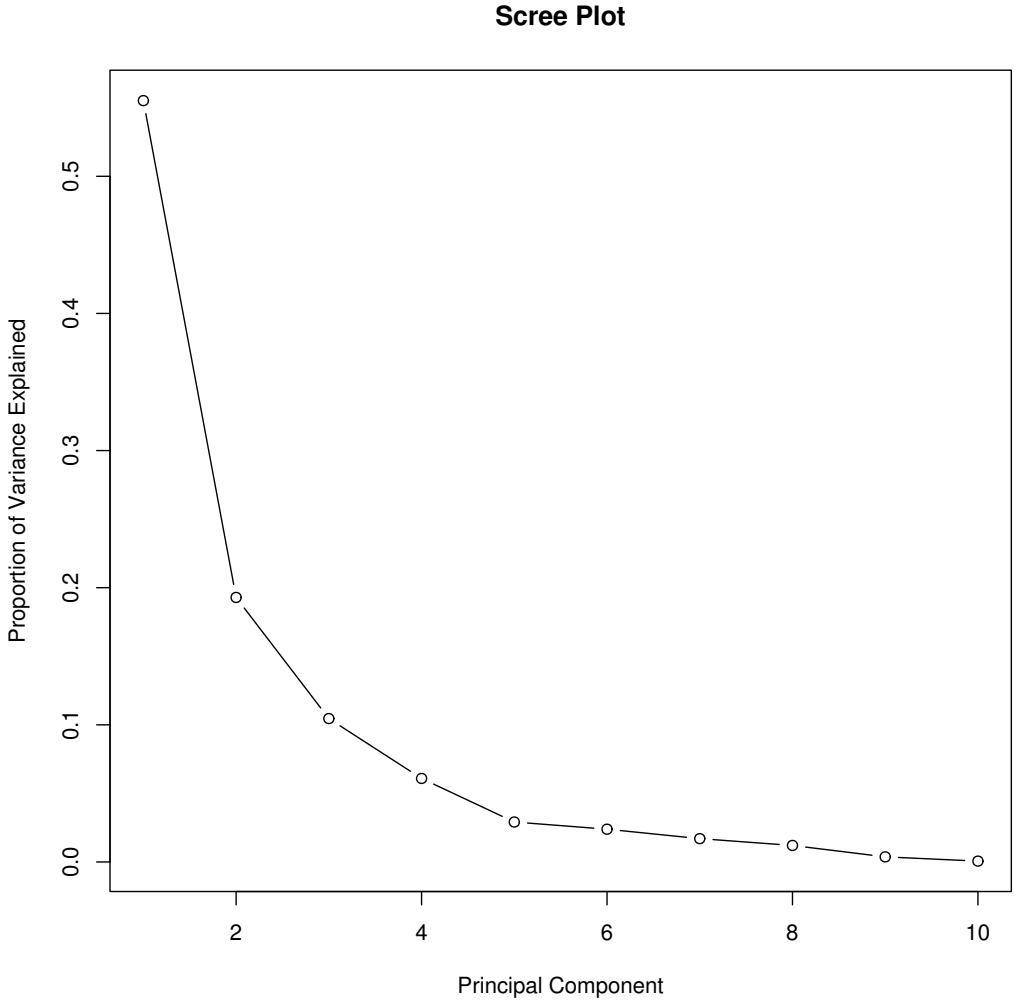


Figure 17: Your caption.

Figure 18: Your caption.

Step 3d. PCA: IPNW WHEAT loss by COUNTY with DAMAGE CAUSE loadings: PC1 and PC2 table

Here we summarize our PCA findings for the inland PNW, for wheat by county, using damage cause as the factor loadings. Here we plot PC1 and PC2 loadings as a table.

Damage cause variable loadings by COUNTY

2001-2015

PC1

PC2

Adams_WA

-3.574

1.325

Asotin_WA

1.703

0.967

Benewah_ID

1.807

-0.563

Benton_WA

1.247

1.232

Columbia_WA

1.559

0.633

Douglas_WA

0.111

0.762

Franklin_WA

1.208

1.038

Garfield_WA

1.575

0.831

Gilliam_OR

0.475

1.027

Grant_WA

0.136

0.859

Idaho_ID

1.132

-2.574

Latah_ID

1.298

-1.538

Lewis_ID

0.691

-2.392

Lincoln_WA

-2.988

1.015

Morrow_OR

-1.805

1.347

Nez Perce_ID

1.167

-0.583

Sherman_OR

1.39

0.415

Spokane_WA

0.836

-1.319

Umatilla_OR

-7.766

0.232

Union_OR

1.928

0.884

Walla Walla_WA

-2.215

-0.184

Wallowa_OR

1.918

0.579

Wasco_OR

0.908

-0.221

Whitman_WA

-2.74

-3.773

Step 3e. PCA: IPNW WHEAT loss by COUNTY with DAMAGE CAUSE loadings: Spatial Mapping of PC1 and PC2

Here we summarize our PCA findings for the inland PNW, for wheat by county, using damage cause as the factor loadings. We take PC1 and PC2 loadings and plot each as a map.

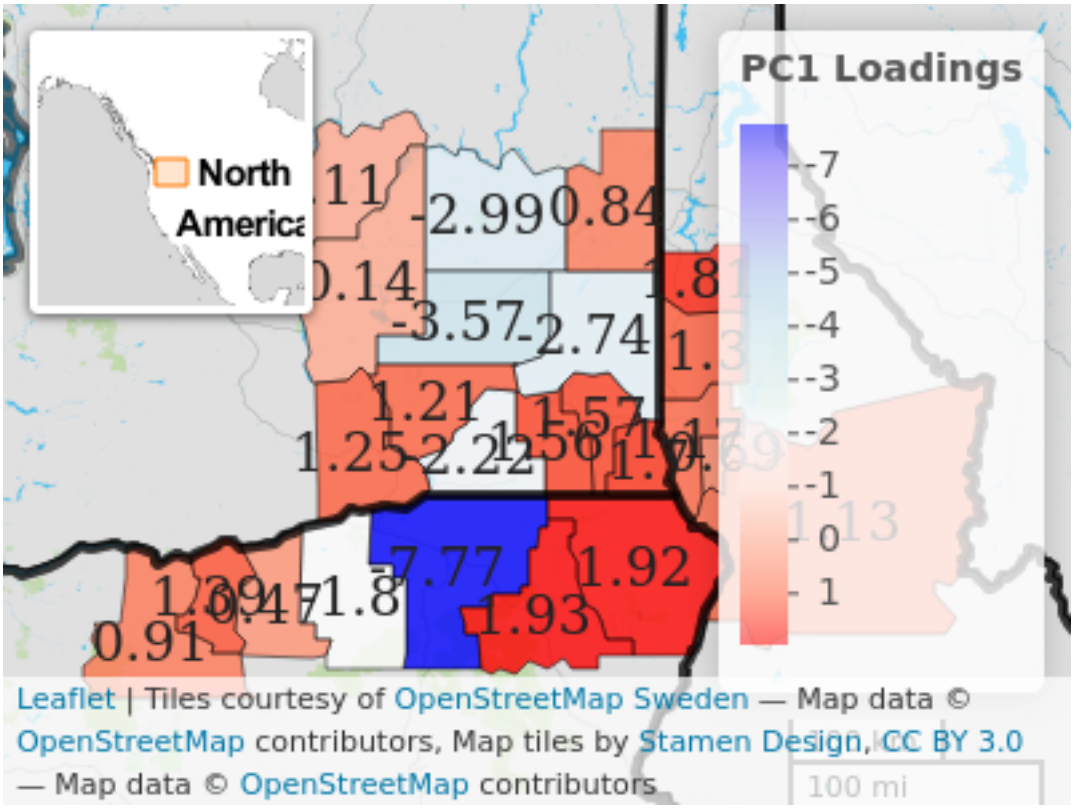


Figure 19: Your caption.

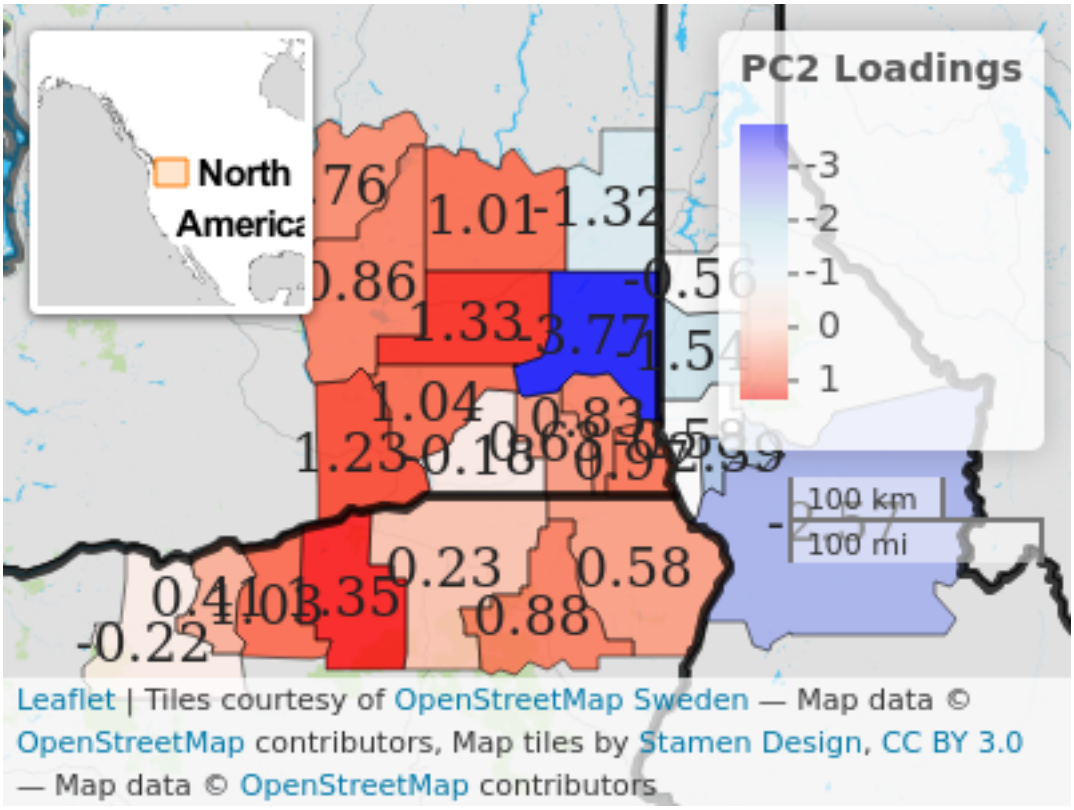


Figure 20: Your caption.

Step 3f. PCA + KMEANS: IPNW WHEAT insurance loss, by YEAR with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the inland PNW, for wheat, by year, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

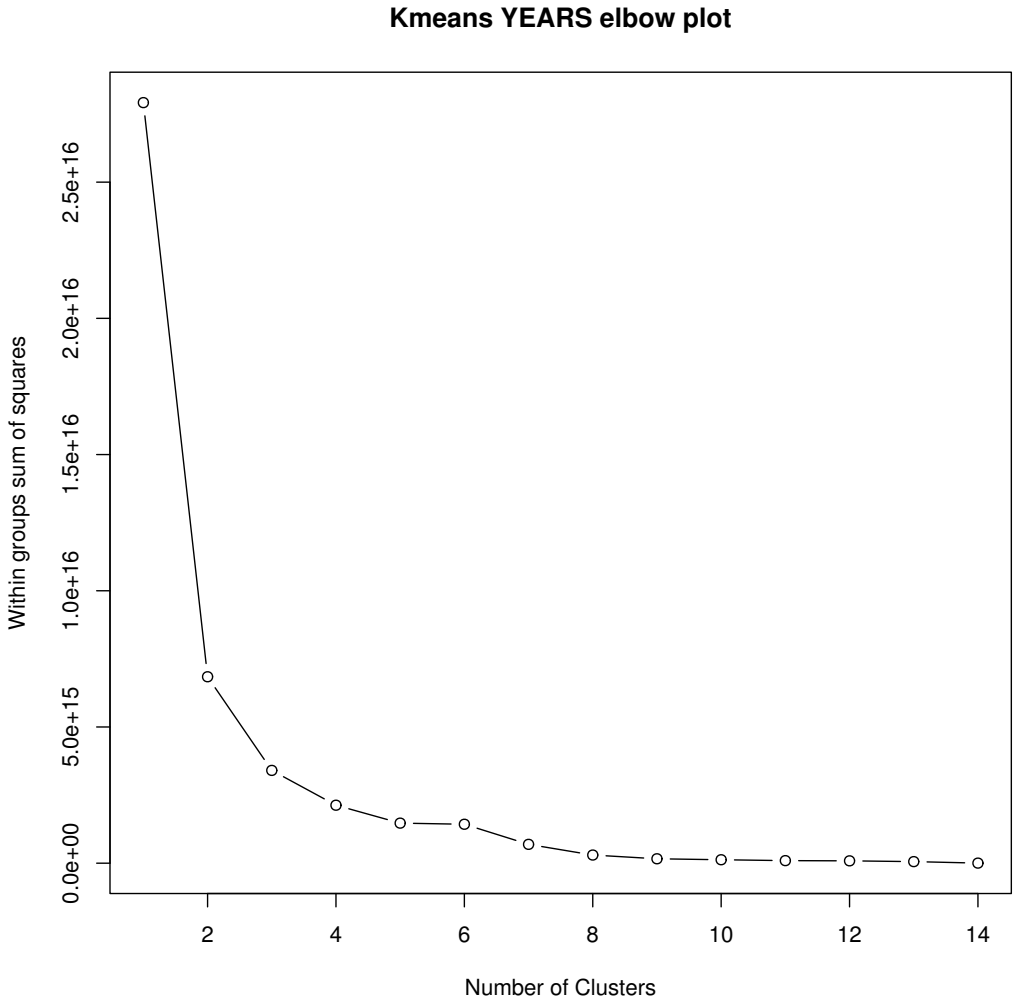


Figure 21: Your caption.

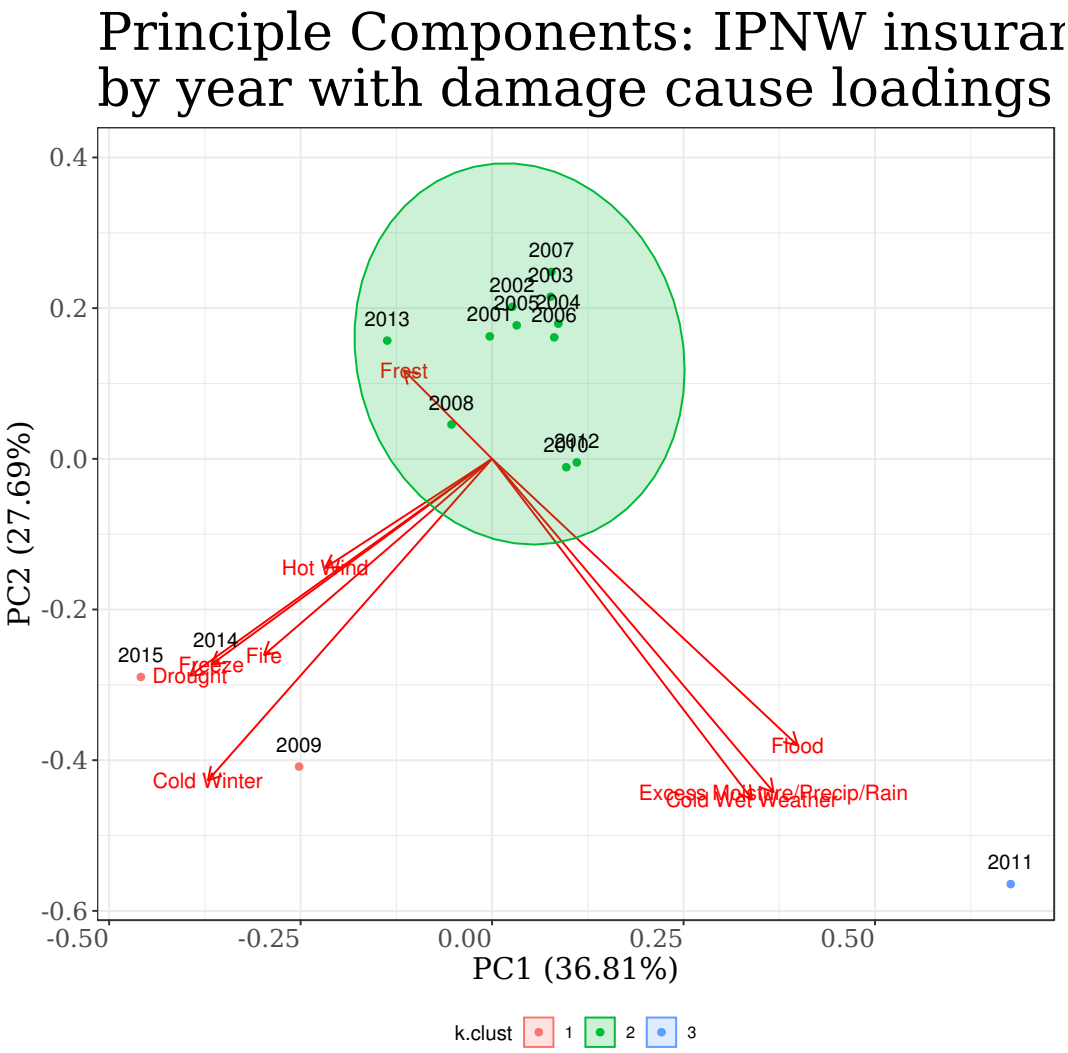


Figure 22: Your caption.

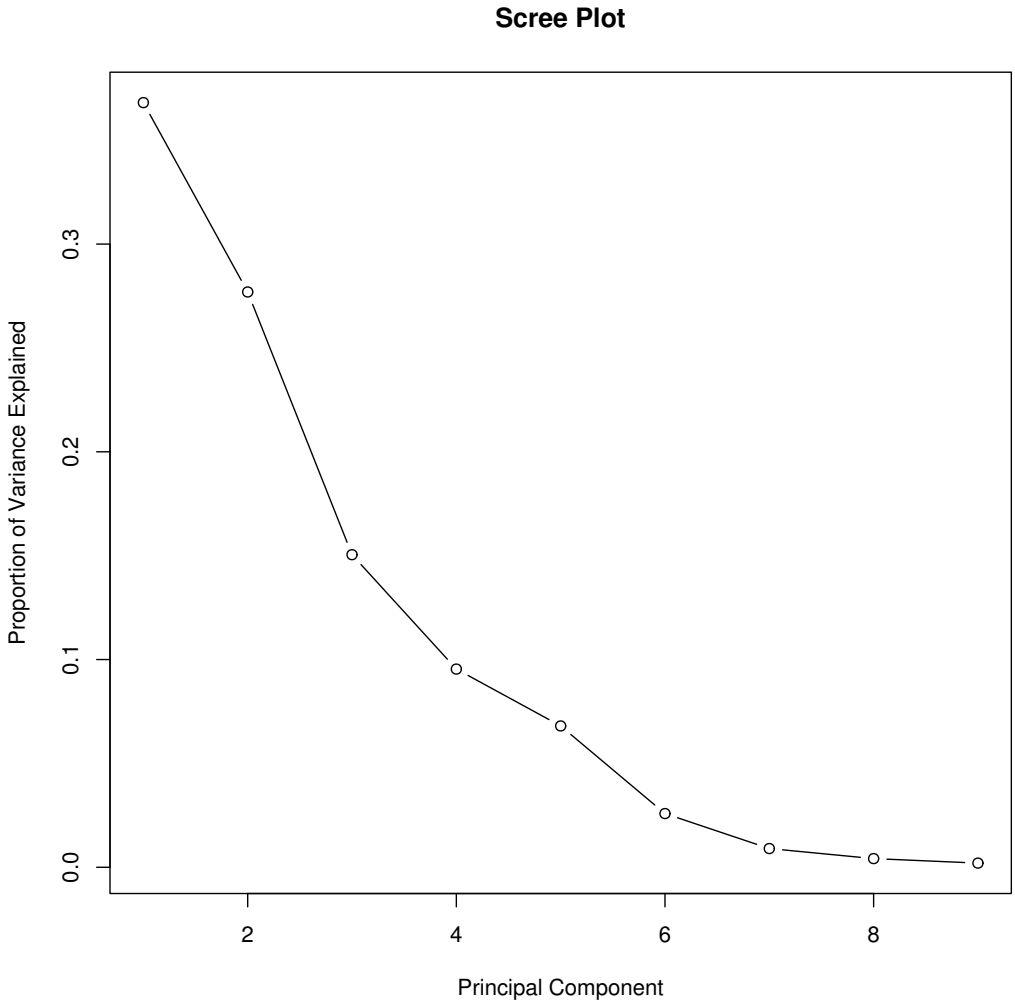


Figure 23: Your caption.

Step 3g. PCA:IPNW WHEAT insurance loss, by YEAR with DAMAGE CAUSE loadings: 2001 to 2015: PC1 vs PC2 barplot

Here we plot PC1 loadings vs PC2 by year, as a barplot, to visualize orthogonal/opposing patterns.

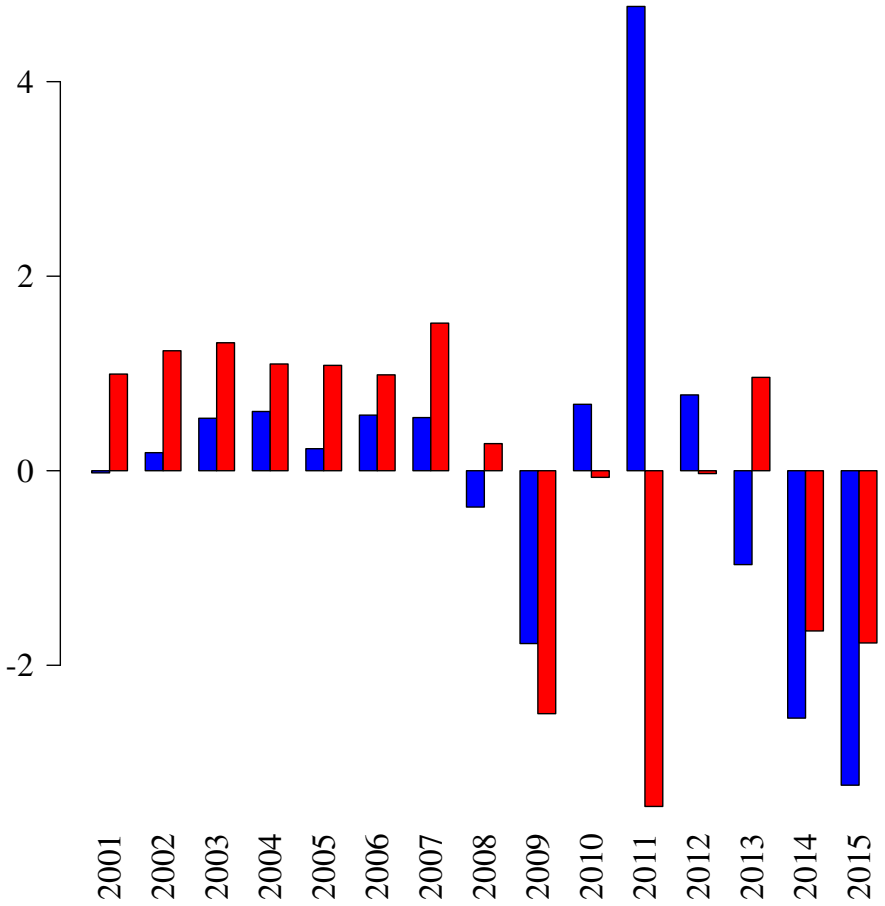


Figure 24: Your caption.

Step 3h. PCA: IPNW WHEAT loss by YEAR with DAMAGE CAUSE loadings: PC1 and PC2 table

Here we summarize our PCA findings for the inland PNW, for wheat by year, using damage cause as the factor loadings. Here we plot PC1 and PC2 loadings as a table.

Damage cause variable loadings by YEAR

2001-2015

PC1

PC2

Cold Wet Weather

0.341

-0.455

Cold Winter

-0.374

-0.43

Drought

-0.397

-0.29

Excess Moisture/Precip/Rain

0.37

-0.445

Fire

-0.3

-0.262

Flood

0.402

-0.383

Freeze

-0.369

-0.275

Frost

-0.116

0.118

Hot Wind

-0.219

-0.146

Step 3i. EXPERIMENTAL: PCA + KMEANS: WHEAT IPNW insurance loss, by COUNTY with DAMAGE CAUSE loadings: 2001 to 2015

Here we perform a PCA for the insurance loss for the inland PNW, for wheat by county, with damage cause as the factor loadings. Data from 2001 is 2015 is used. We additionally have generated a scree plot that shows the proportion of variance explained by the individual components.

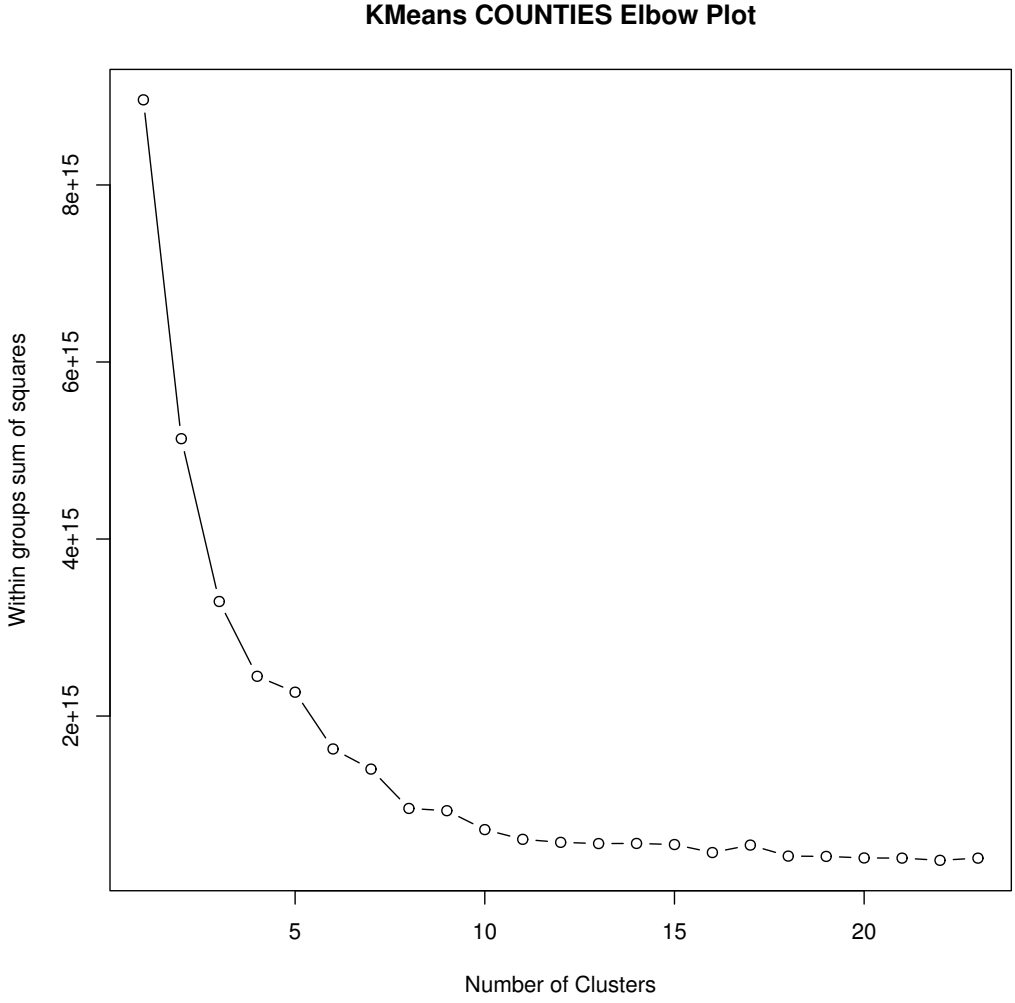


Figure 25: Your caption.

```
## *** : The Hubert index is a graphical method of determining the number of clusters.
##                 In the plot of Hubert index, we seek a significant knee that corresponds to a
##                 significant increase of the value of the measure i.e the significant peak in Hubert
##                 index second differences plot.
##


## *** : The D index is a graphical method of determining the number of clusters.
##                 In the plot of D index, we seek a significant knee (the significant peak in Dindex
##                 second differences plot) that corresponds to a significant increase of the value of
```

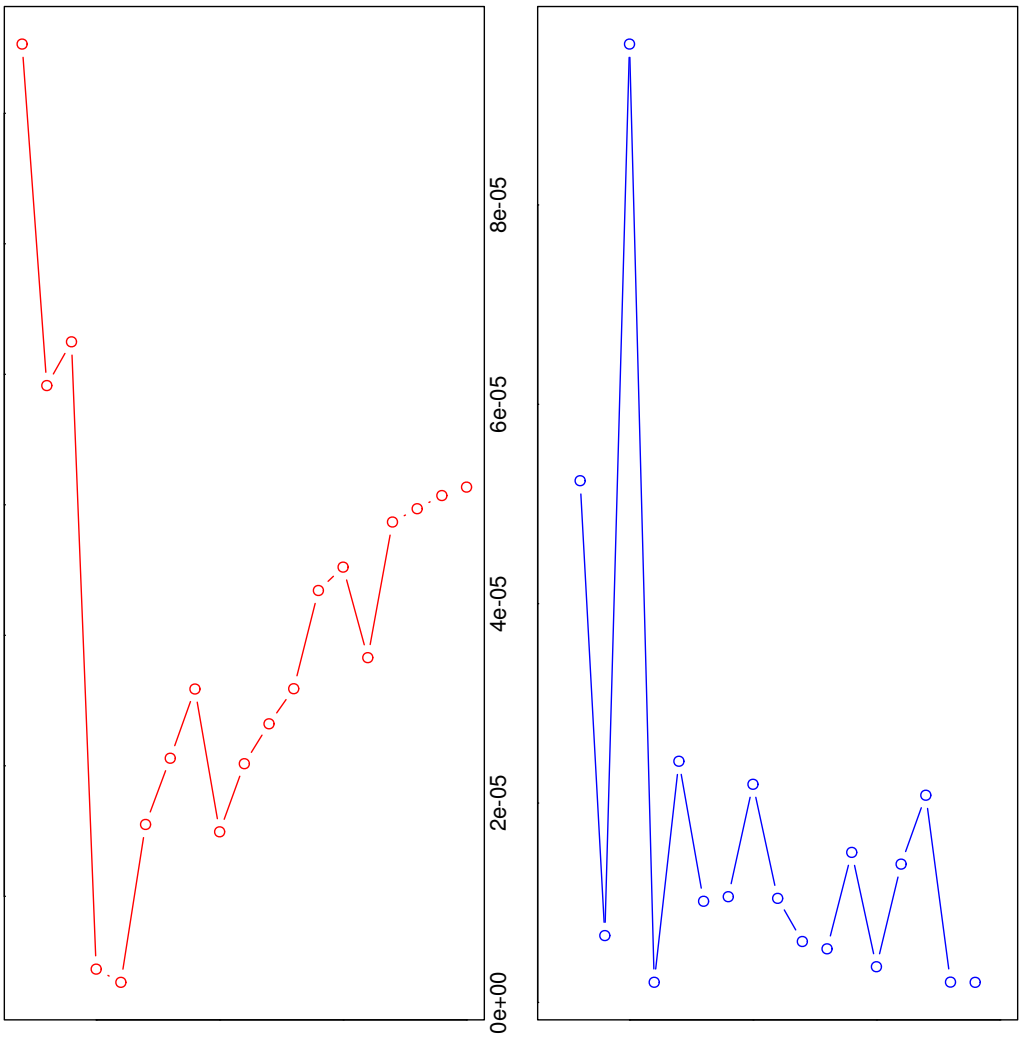


Figure 26: Your caption.

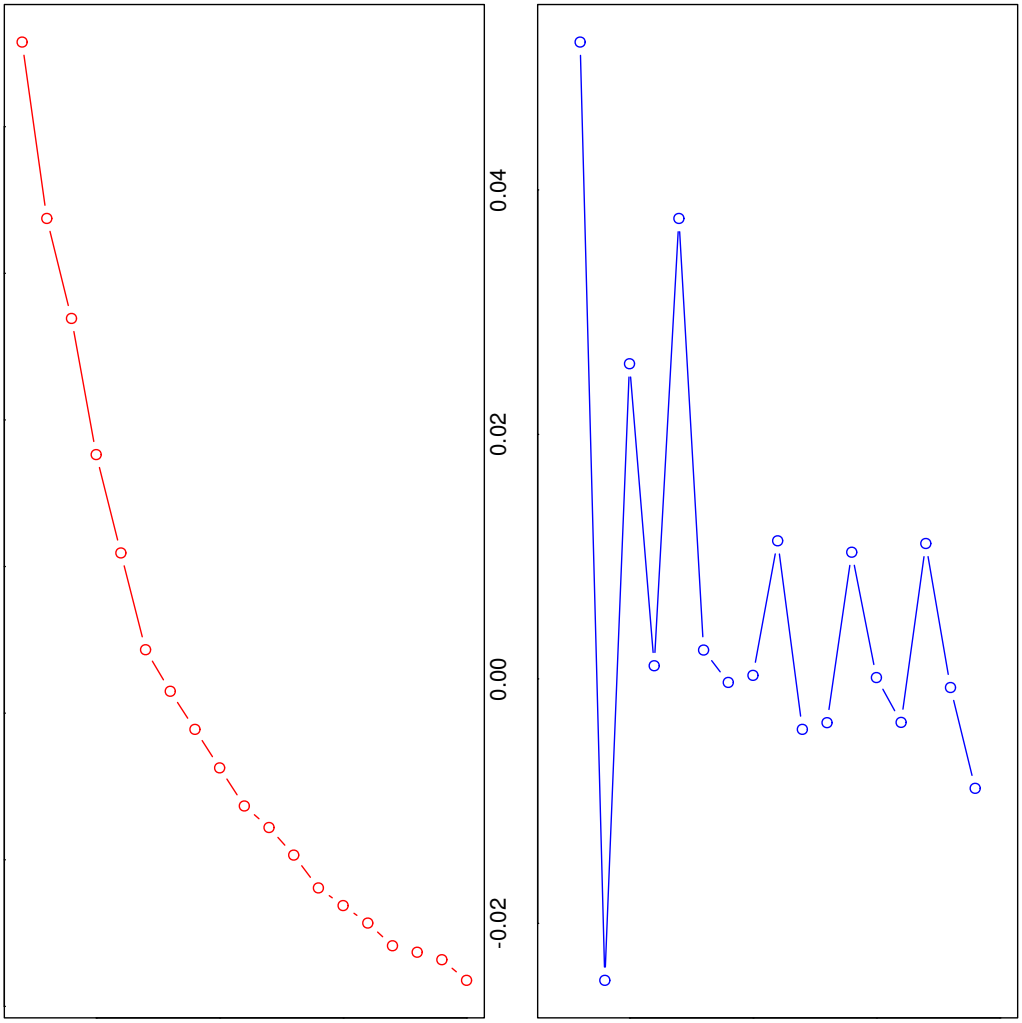


Figure 27: Your caption.

```
##                 the measure.
##
## *****************************************************************
## * Among all indices:
## * 5 proposed 2 as the best number of clusters
## * 5 proposed 3 as the best number of clusters
## * 1 proposed 4 as the best number of clusters
## * 3 proposed 5 as the best number of clusters
## * 4 proposed 10 as the best number of clusters
## * 4 proposed 16 as the best number of clusters
## * 1 proposed 20 as the best number of clusters
##
##                    ***** Conclusion *****
##
## * According to the majority rule, the best number of clusters is  2
##
##
## *****************************************************************
```

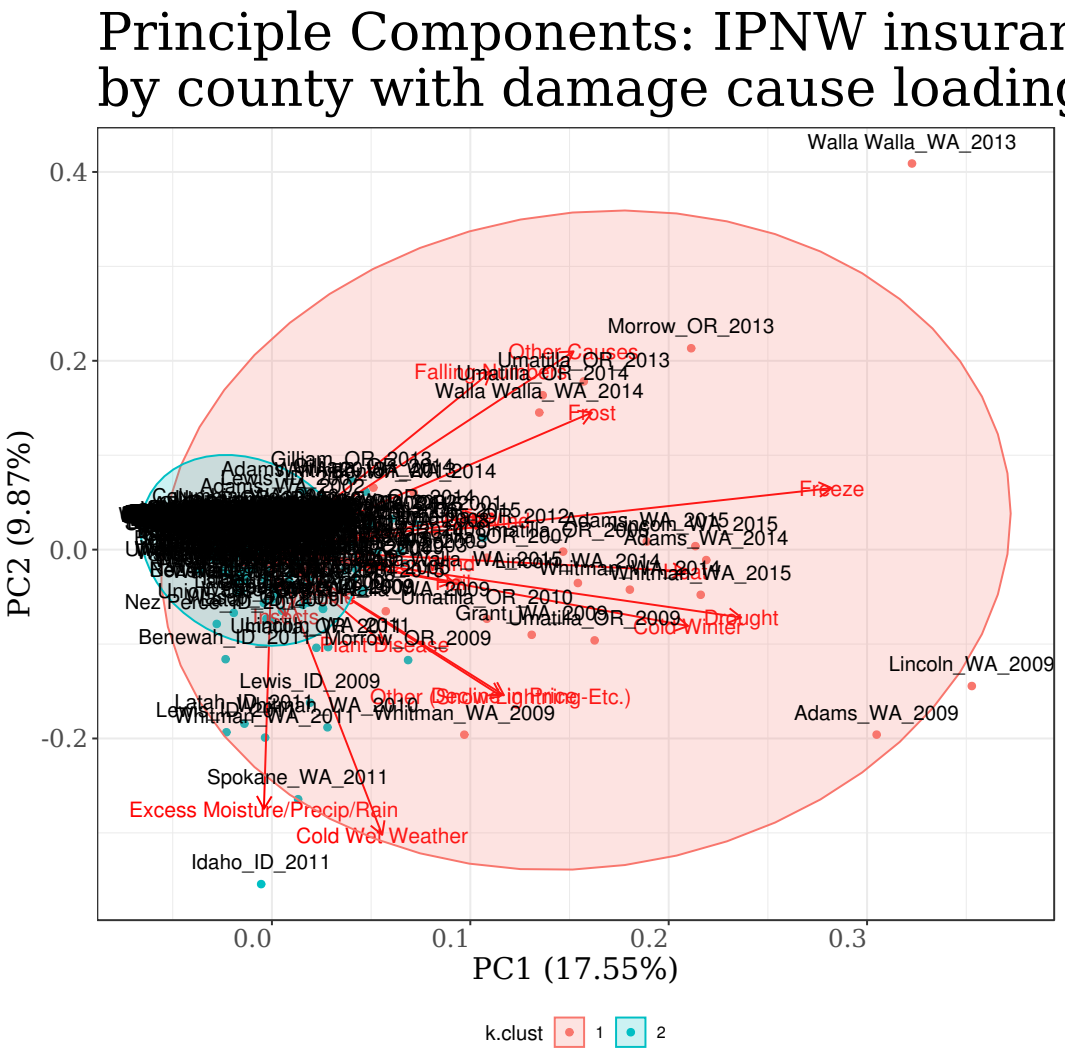


Figure 28: Your caption.

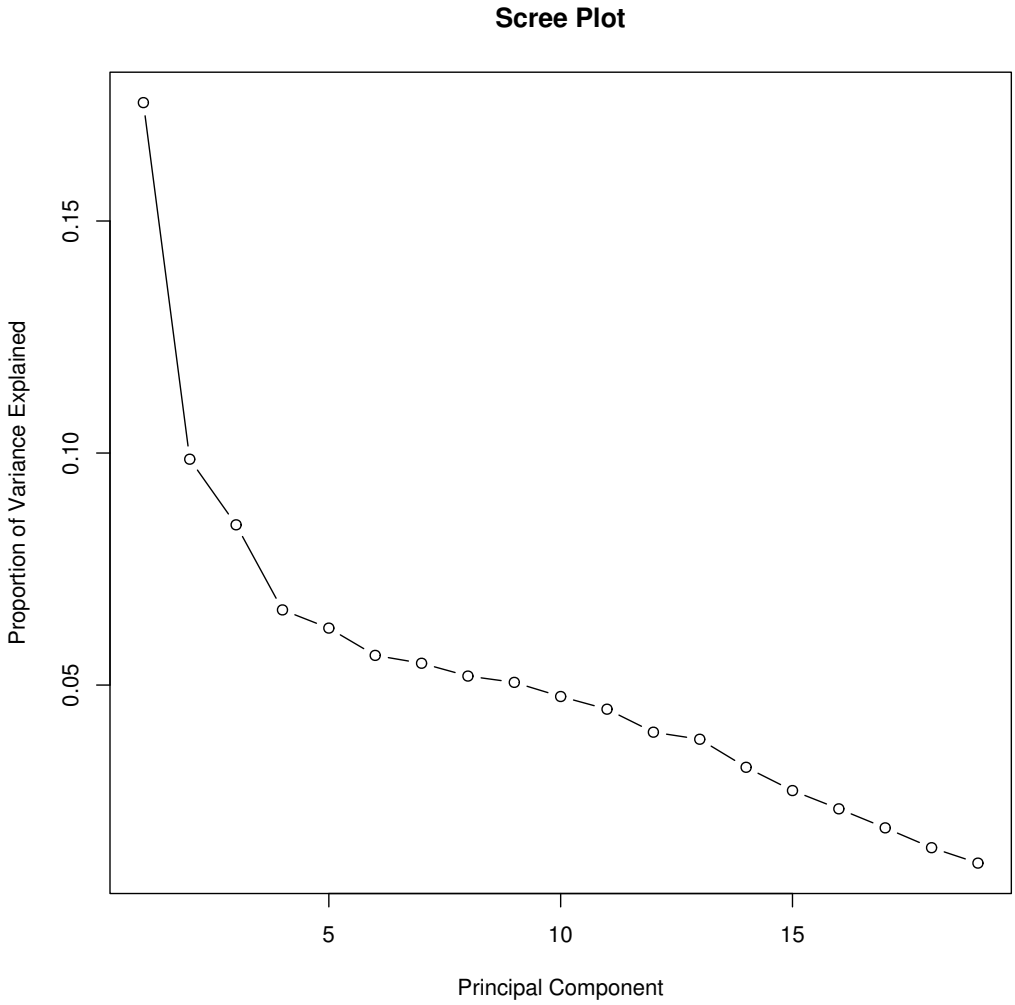


Figure 29: Your caption.