

# Supplemental Materials for: Climatic Damage Cause Variations of Agricultural Insurance Loss for the Pacific Northwest Region of the United States

The material contained herein is supplementary to the article named in the title and  
submitted to the journal, Agriculture.

November 2023

This supplemental appendix provides exploratory data and factor analyses of agricultural insurance loss for  
the Pacific Northwest (PNW) and the inland Pacific Northwest (iPNW) of the United States.

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### **1. Agricultural Insurance Loss Example Table**

Table S1. Example of insurance loss records that were acquired from the USDA Risk Management Agency (RMA). Each record represents an individual insurance claim. Full datasets are available via the following DOI: <https://doi.org/10.5061/dryad.hhmgqnknh>

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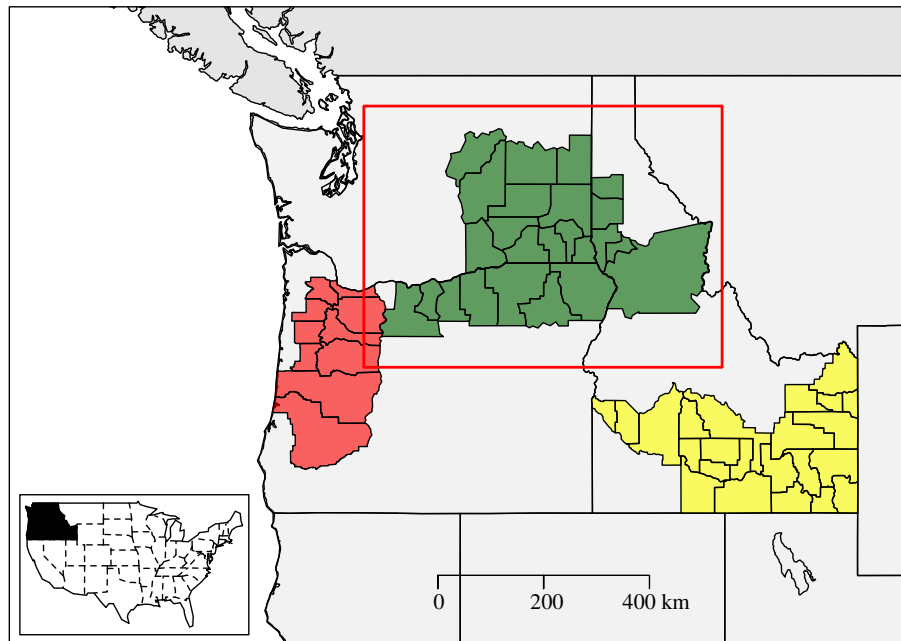
Figure S22. Top panel: IPNW Apples by county, with damage cause as factor loadings, using a Kmeans technique for grouping. Bottom panel: Scree plot. Data from 2001 to 2022 is used.

## 1. Agricultural Insurance Loss Example Table

**Table S 1.** Example of insurance loss records that were acquired from the USDA Risk Management Agency (RMA). Each record represents an individual insurance claim. Full datasets are available via the following DOI: <https://doi.org/10.5061/dryad.hhmgqnknh>

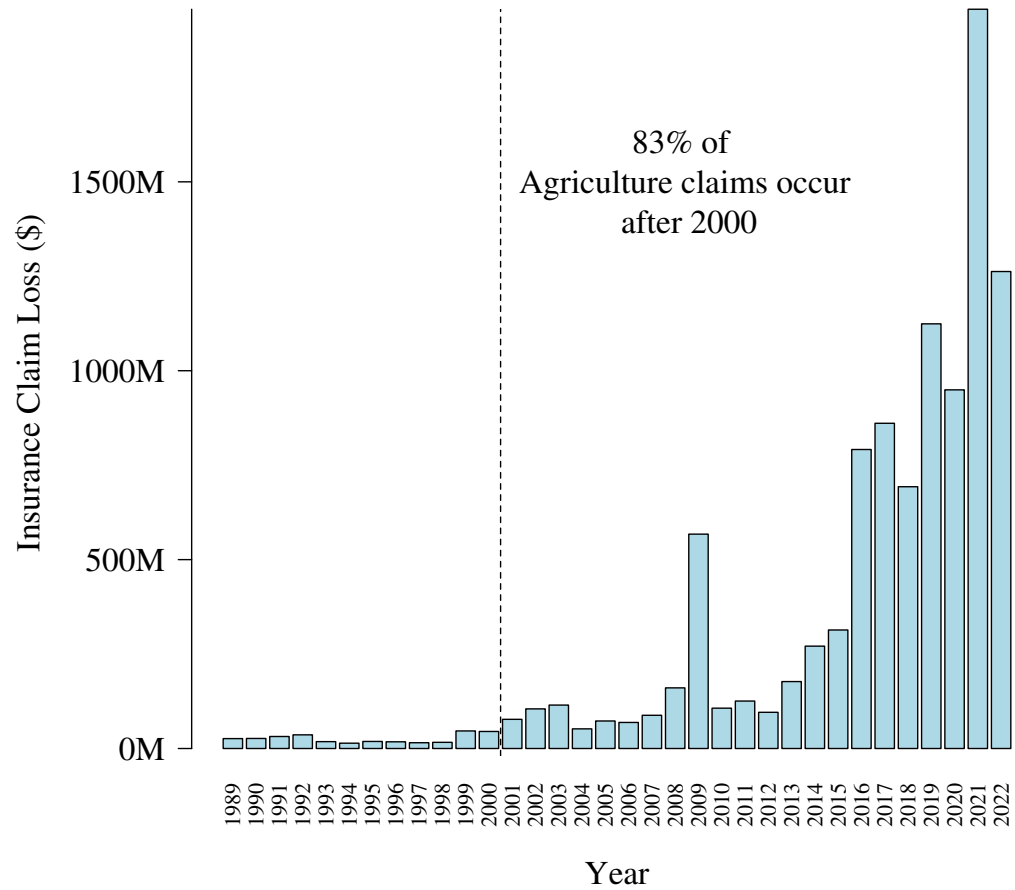
| year | state | county  | commodity       | damagecause      | month | acres    | loss     | lossperacre | croptyear |
|------|-------|---------|-----------------|------------------|-------|----------|----------|-------------|-----------|
| 2001 | ID    | Ada     | All Other Crops | Drought          | SEP   | 17.000   | 153.00   | 9.000000    | 2001      |
| 2001 | ID    | Ada     | All Other Crops | Heat             | AUG   | 105.200  | 5249.00  | 49.895437   | 2001      |
| 2001 | ID    | Ada     | All Other Crops | Freeze           | APR   | 125.000  | 4500.00  | 36.000000   | 2001      |
| 2001 | ID    | Ada     | All Other Crops | Wind/Excess Wind | MAY   | 50.000   | 1800.00  | 36.000000   | 2001      |
| 2001 | ID    | Ada     | All Other Crops | Wind/Excess Wind | APR   | 92.500   | 3330.00  | 36.000000   | 2001      |
| 2001 | ID    | Bannock | WHEAT           | Drought          | AUG   | 133.000  | 1212.00  | 9.112782    | 2001      |
| 2001 | ID    | Bannock | WHEAT           | Drought          | SEP   | 777.520  | 24807.00 | 31.905289   | 2001      |
| 2001 | ID    | Bannock | WHEAT           | Drought          | JUL   | 3529.754 | 54726.46 | 15.504327   | 2001      |
| 2001 | ID    | Bannock | WHEAT           | Heat             | JUL   | 19.796   | 2371.60  | 119.801980  | 2001      |

## 2. Study Area Figure

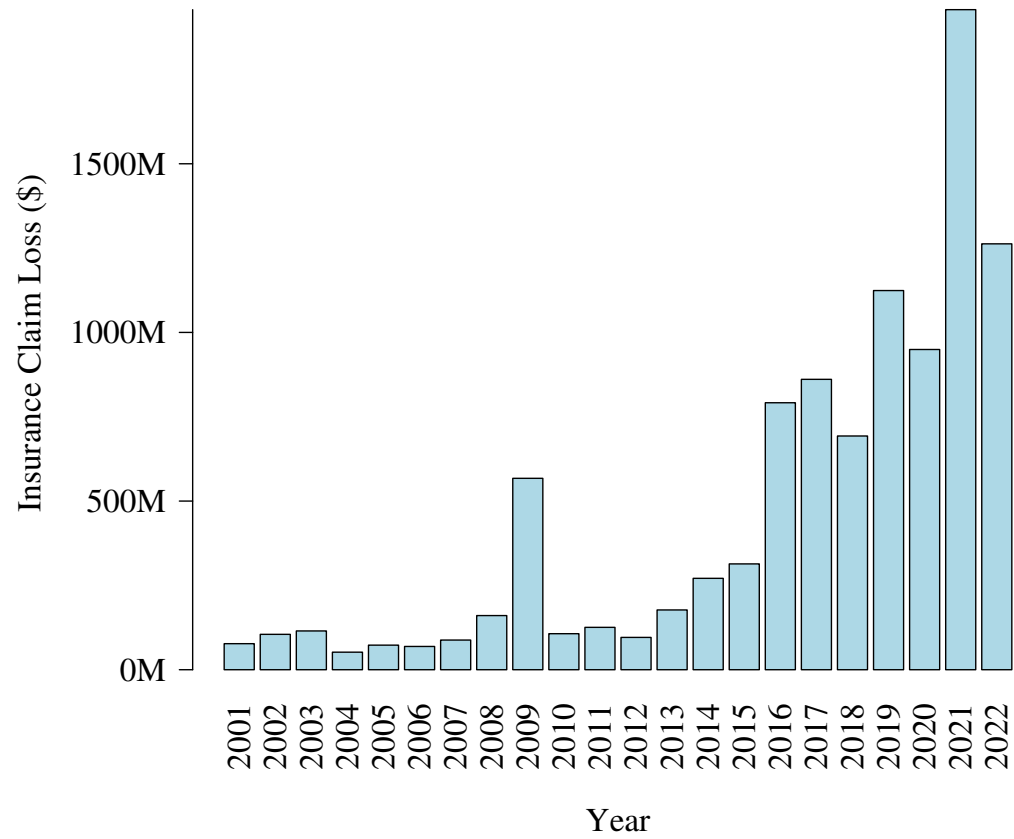


**Figure S 1.** Pacific Northwest study area, which includes agricultural regions for the inland Pacific Northwest, the southern Idaho valley, and the Willamette valley.

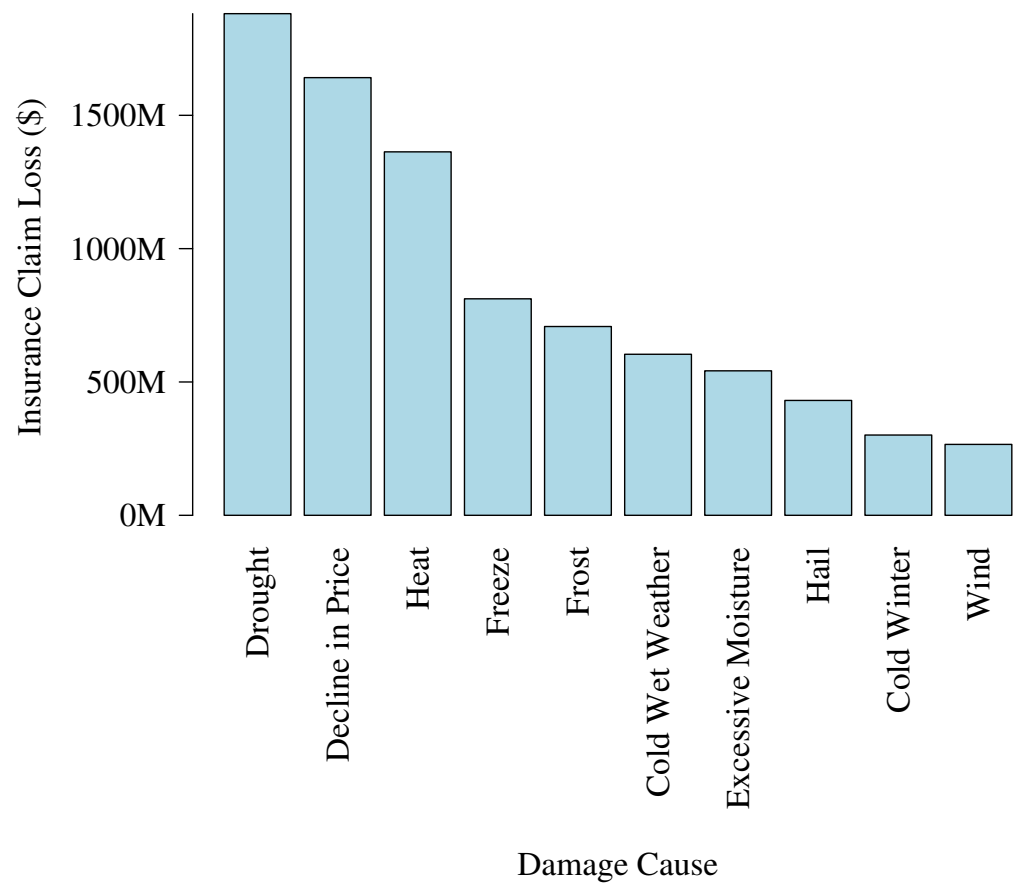
### 3. Pacific Northwest (PNW) Insurance Summaries Figures



**Figure S 2.** Pacific Northwest agricultural insurance loss by year, 1989 to 2022

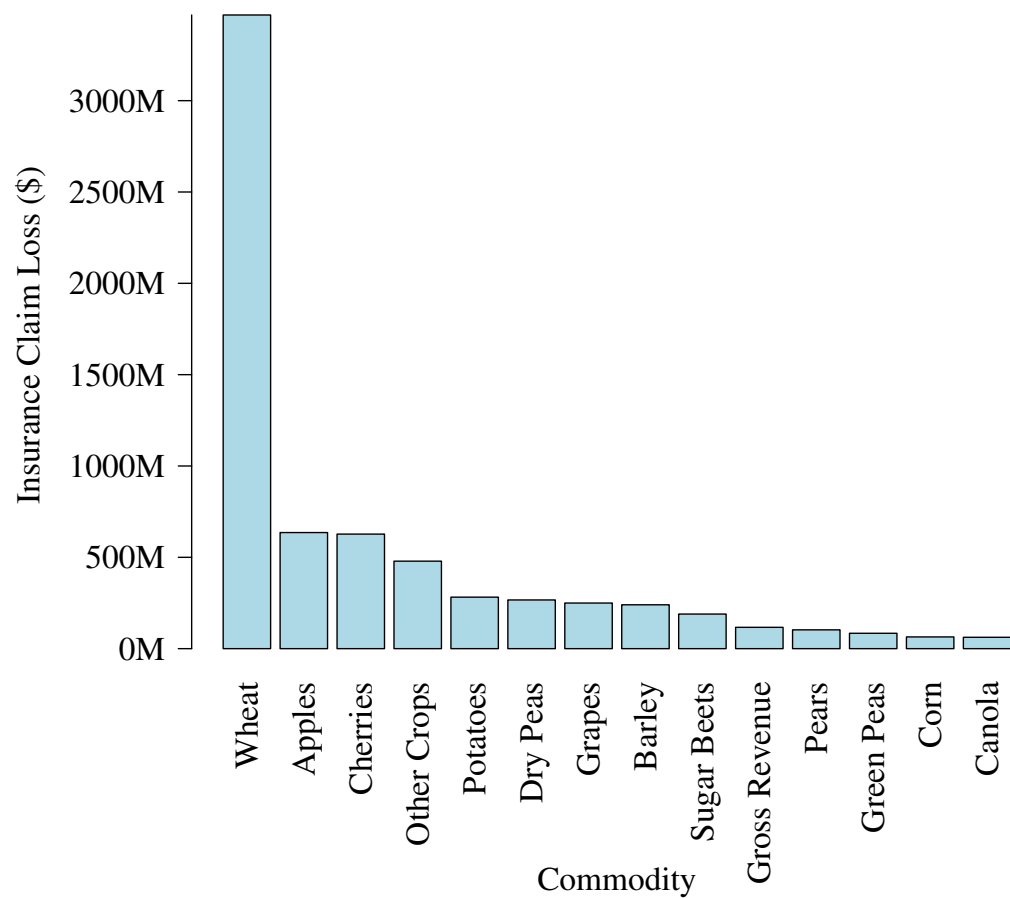


**Figure S 3.** Pacific Northwest agricultural insurance loss by year: 2001 to 2022



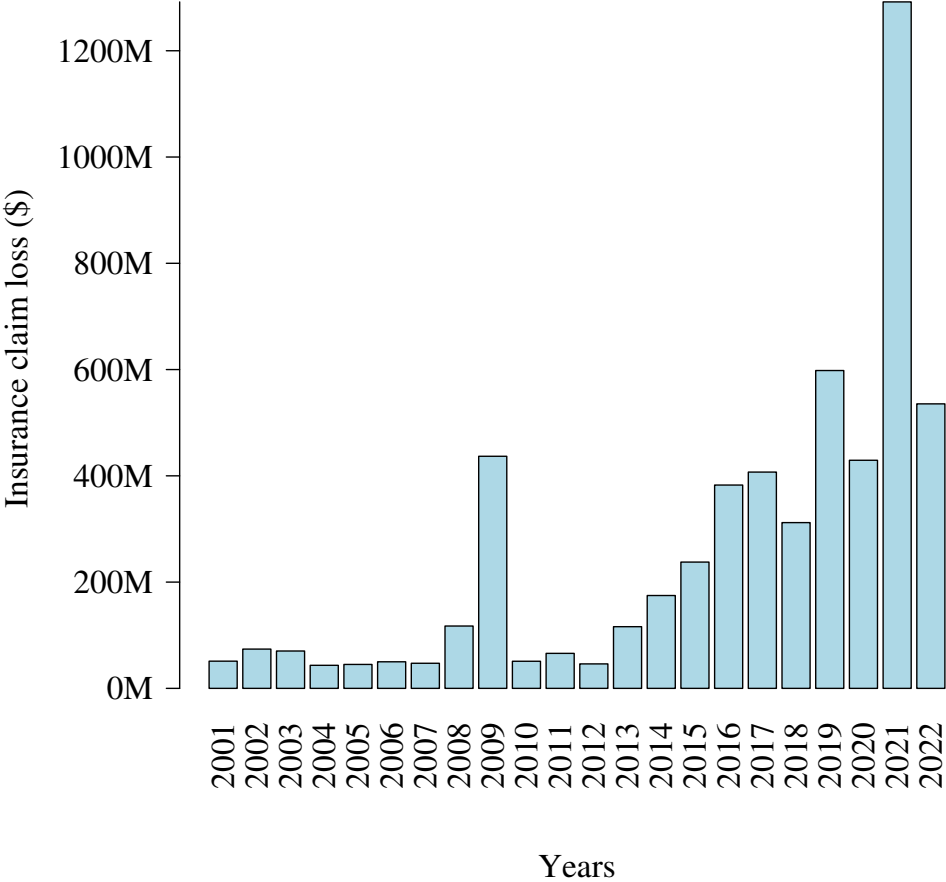
**Figure S 4.** Pacific Northwest agricultural insurance loss by damage cause: 2001 to 2022.



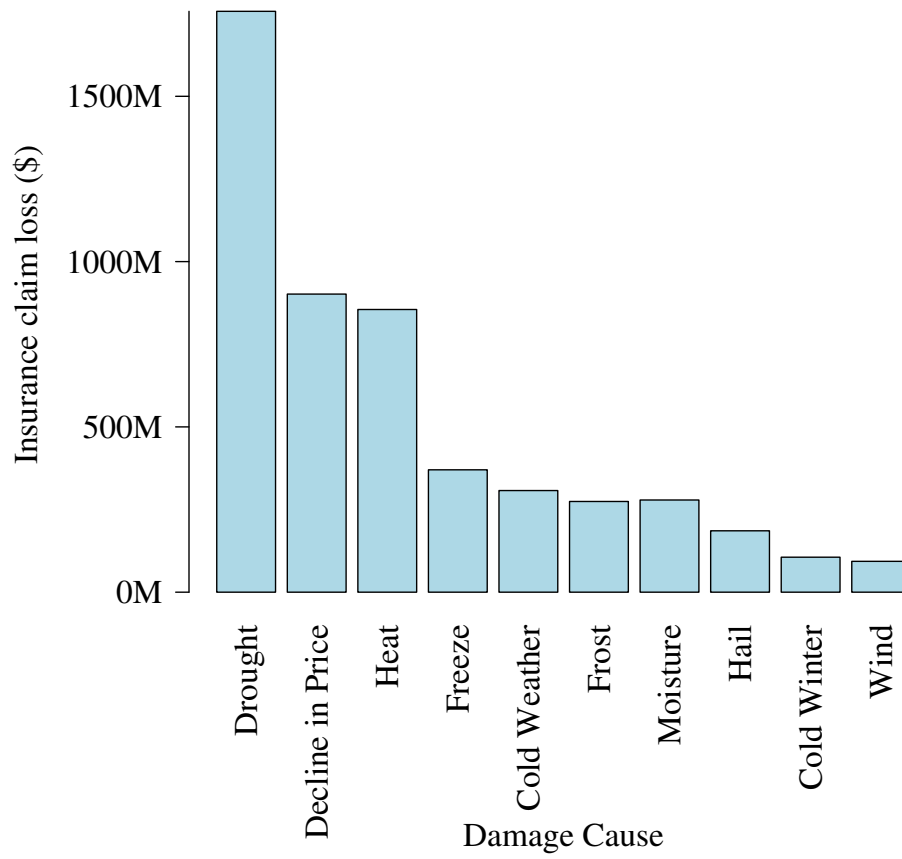


**Figure S 5.** Pacific Northwest agricultural insurance loss by commodity: 2001 to 2022.

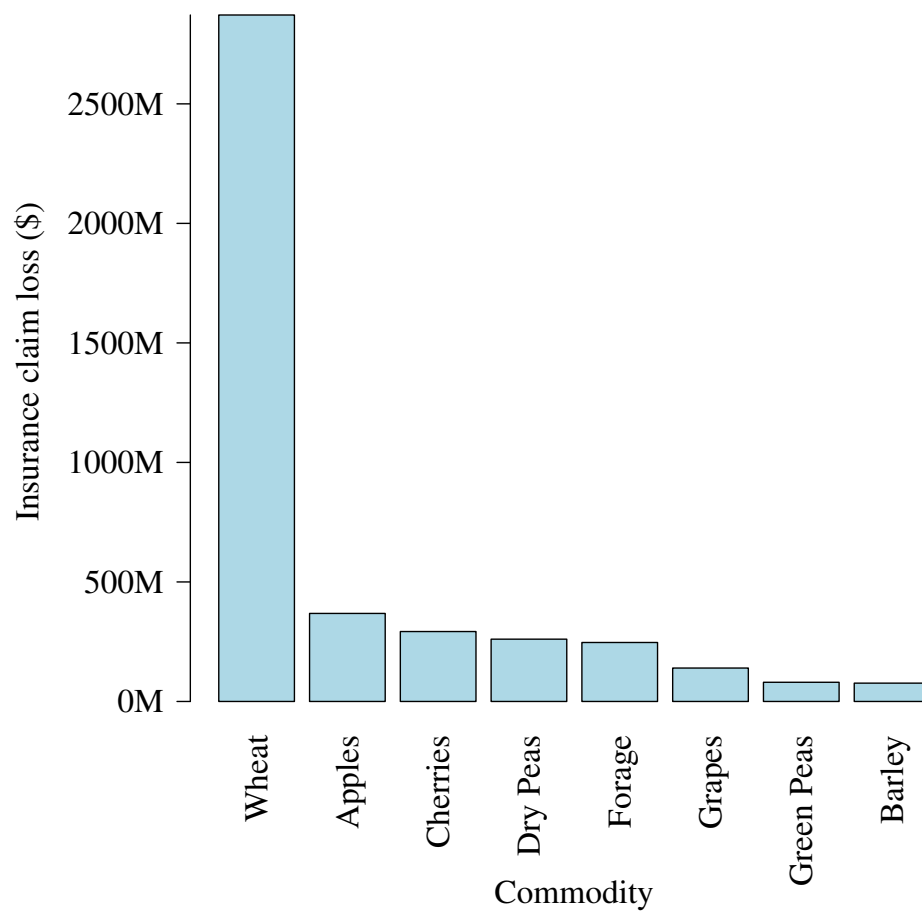
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**Figure S 6.** Inland Pacific Northwest agricultural insurance loss by year, 2001 to 2022.



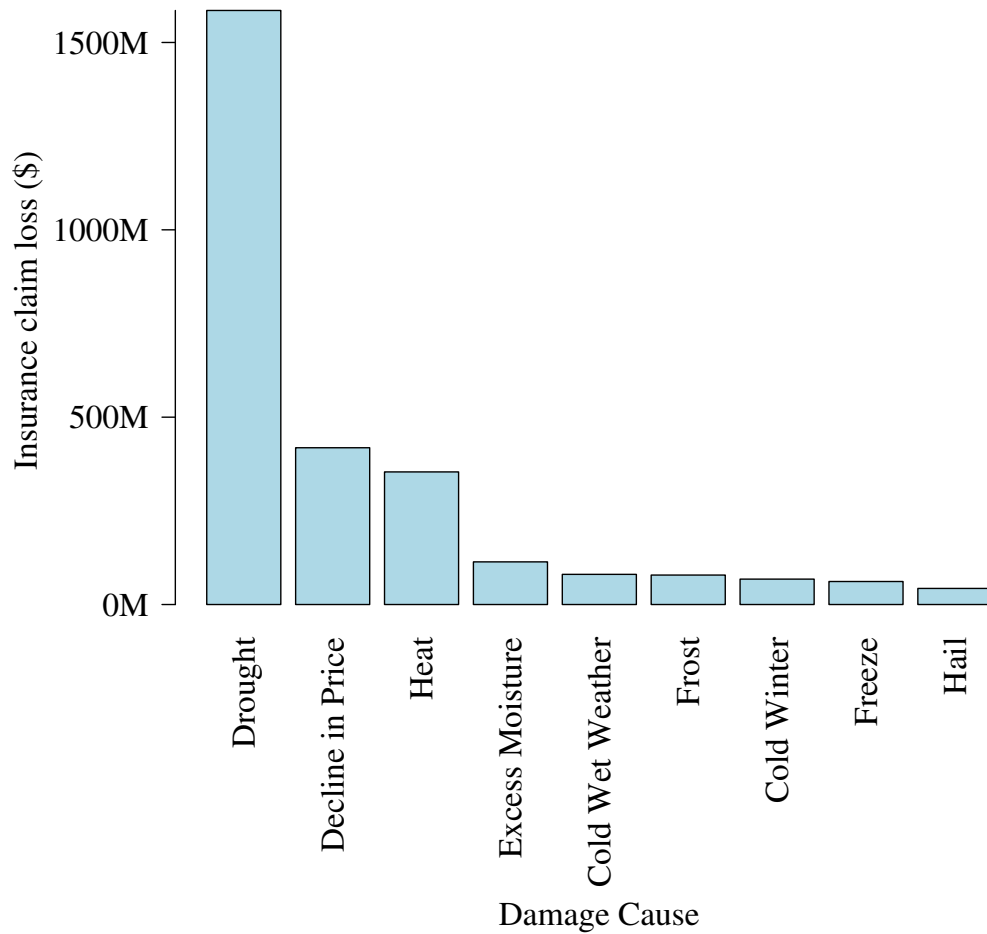
**Figure S 7.** Inland Pacific Northwest agricultural insurance loss by damage cause, 2001 to 2022.



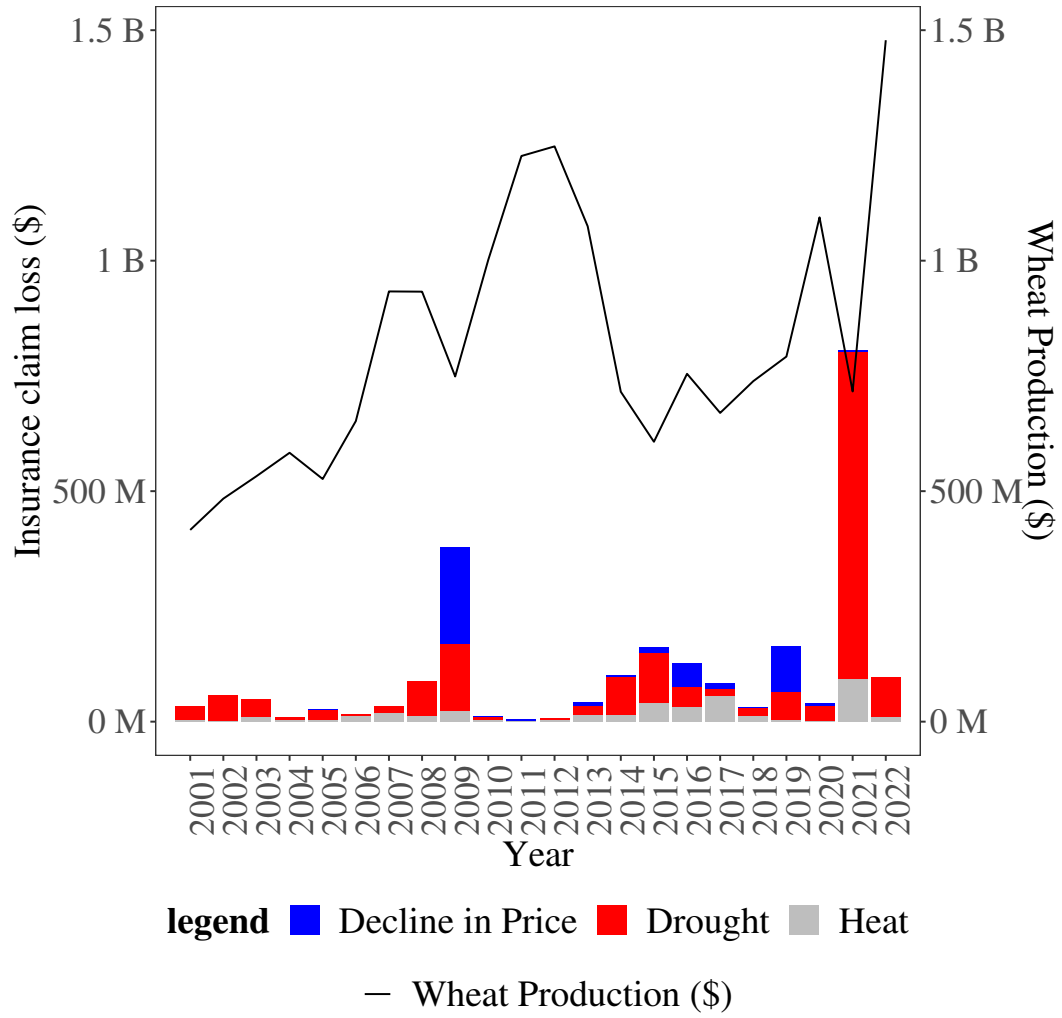
**Figure S 8.** Inland Pacific Northwest agricultural insurance loss by commodity, 2001 to 2022.

## 5. Inland Pacific Northwest (iPNW) Wheat and Apples Insurance Summaries

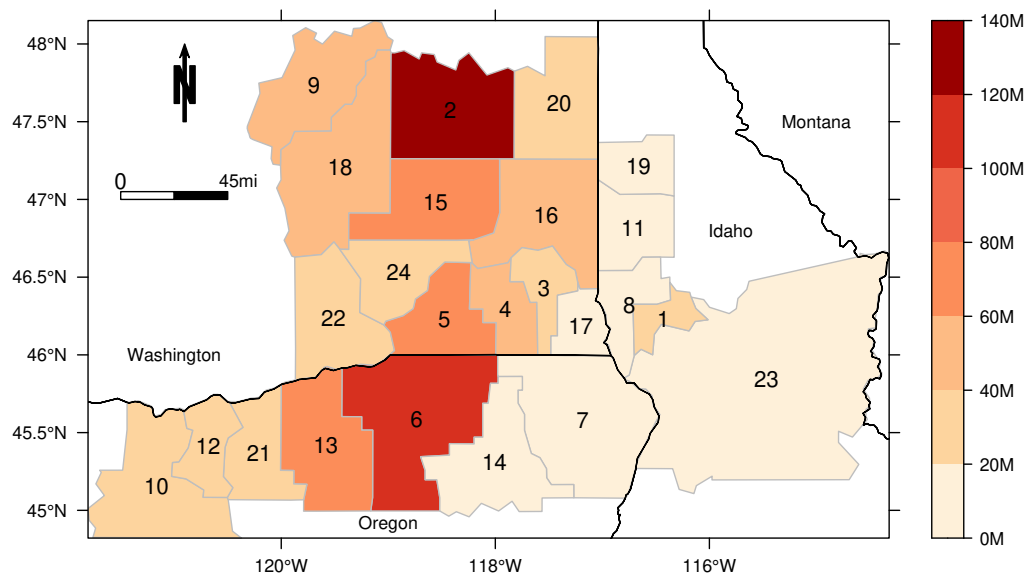
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**Figure S 9.** Inland Pacific Northwest agricultural insurance loss for wheat, by damage cause, 2001 to 2022.



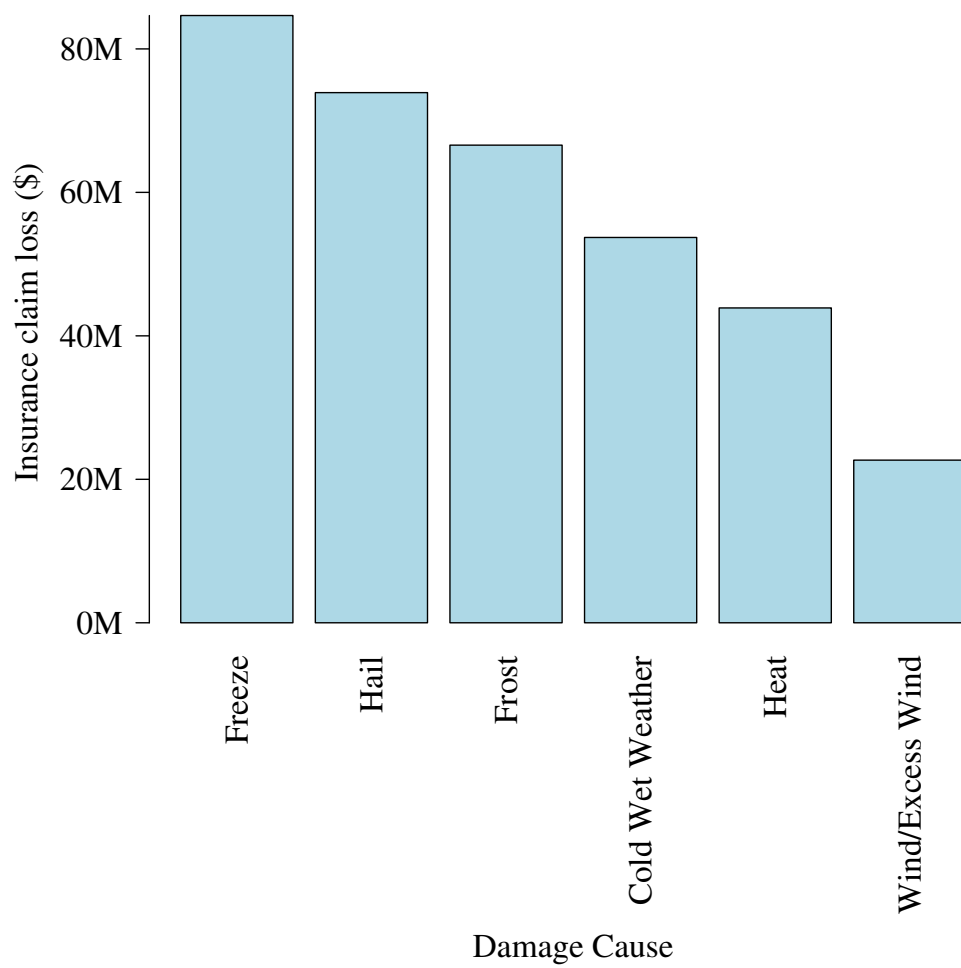
**Figure S 10.** Inland Pacific Northwest stacked barplot of annual wheat agricultural insurance loss, by top damage causes, 2001 to 2022.



#### Drought and Heat Damage Cause

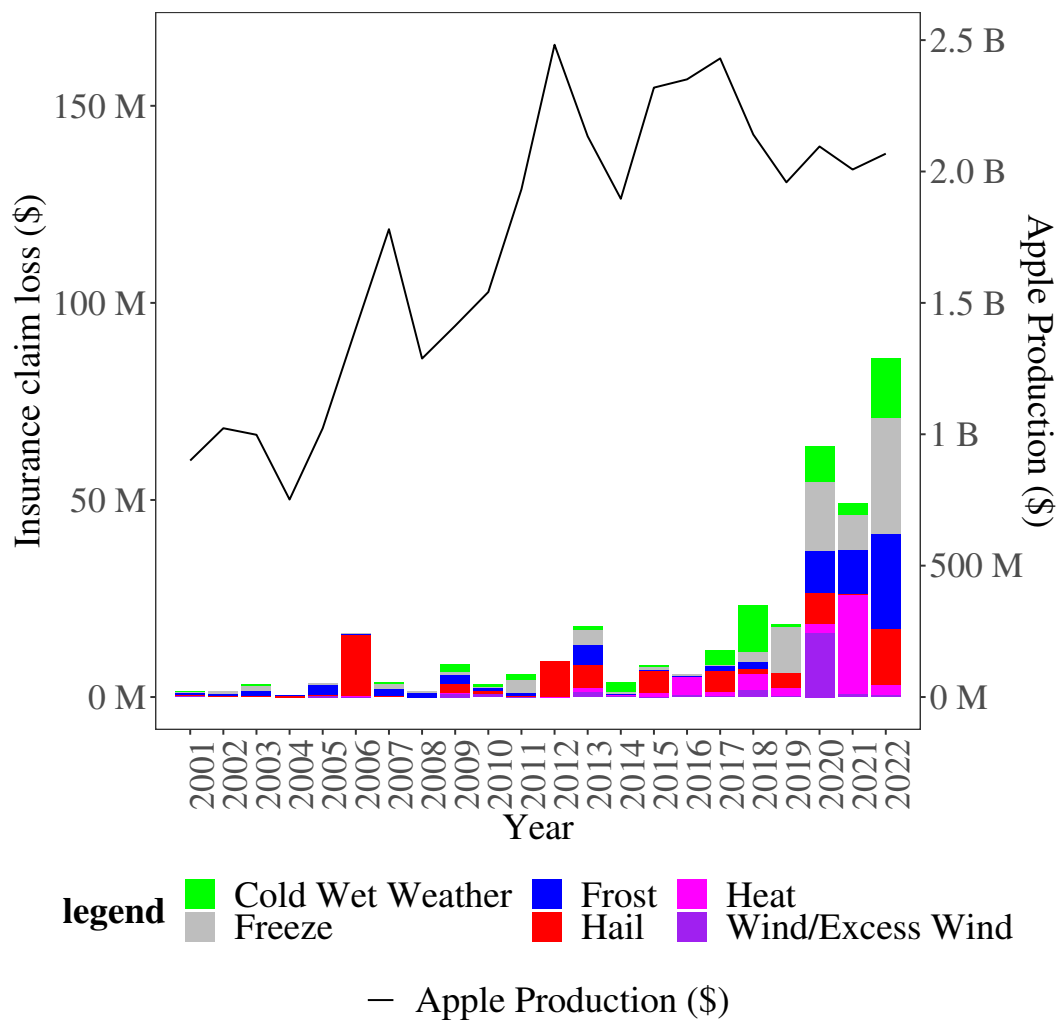
1 Lewis: 2 Lincoln: 3 Garfield: 4 Columbia: 5 Walla Walla: 6 Umatilla: 7 Wallowa  
 8 Nez Perce: 9 Douglas: 10 Wasco: 11 Latah: 12 Sherman: 13 Morrow: 14 Union  
 15 Adams: 16 Whitman: 17 Asotin: 18 Grant: 19 Benewah: 20 Spokane  
 21 Gilliam: 22 Benton: 23 Idaho: 24 Franklin

Figure S 11: Inland Pacific Northwest map of wheat losses, 2001 to 2022.

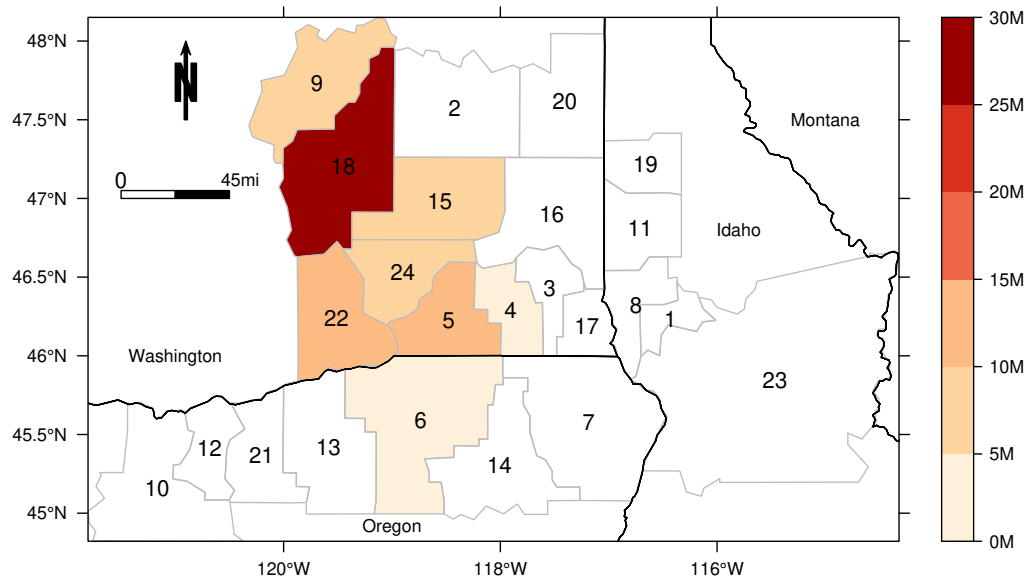


**Figure S 12.** Inland Pacific Northwest agricultural insurance loss for apples, by damage cause, 2001 to 2022.





**Figure S 13.** Inland Pacific Northwest stacked barplot of annual apples agricultural insurance loss, by top damage causes, 2001 to 2022.

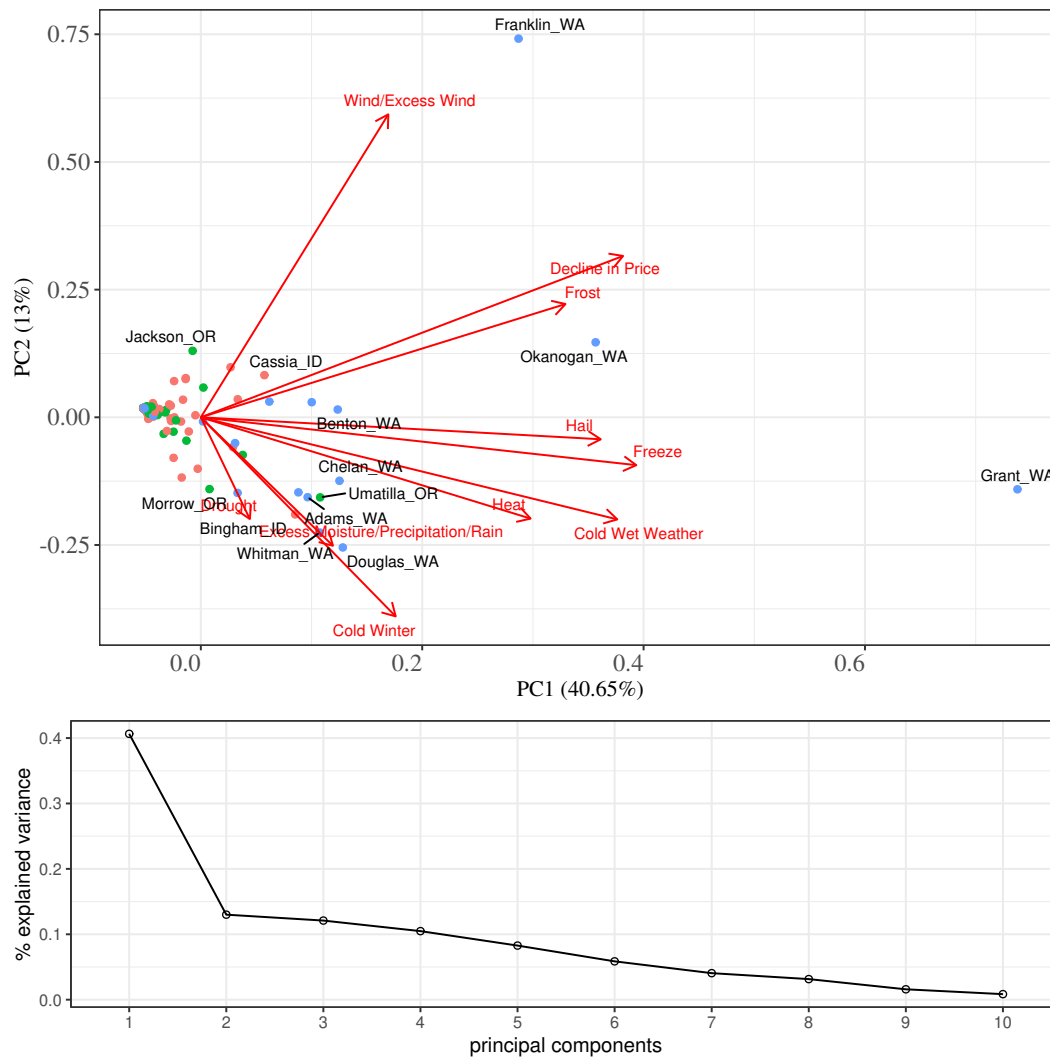


#### Freeze, Frost, Hail Damage Cause

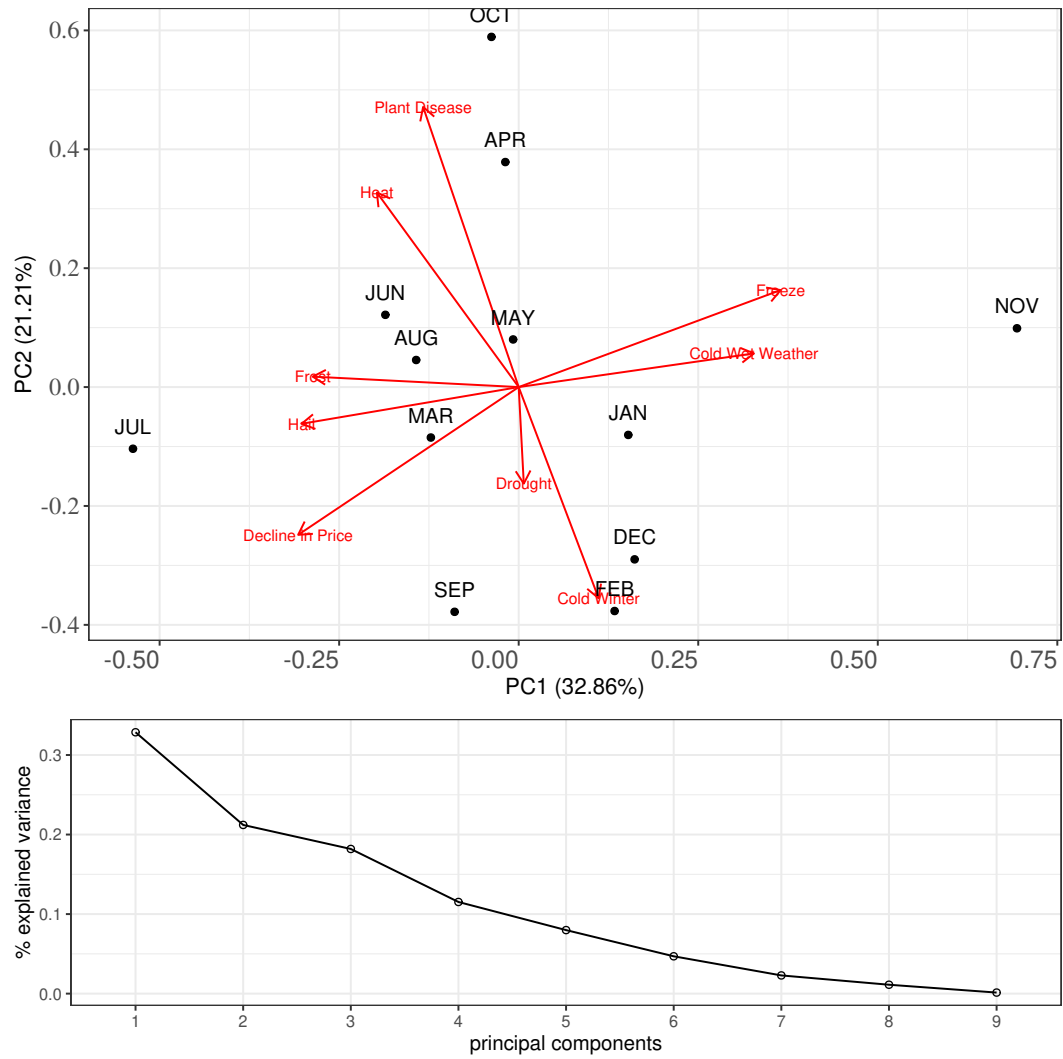
1 Lewis: 2 Lincoln: 3 Garfield: 4 Columbia: 5 Walla Walla: 6 Umatilla: 7 Wallowa  
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Figure S 14: Inland Pacific Northwest map of apple losses, 2001 to 2022.

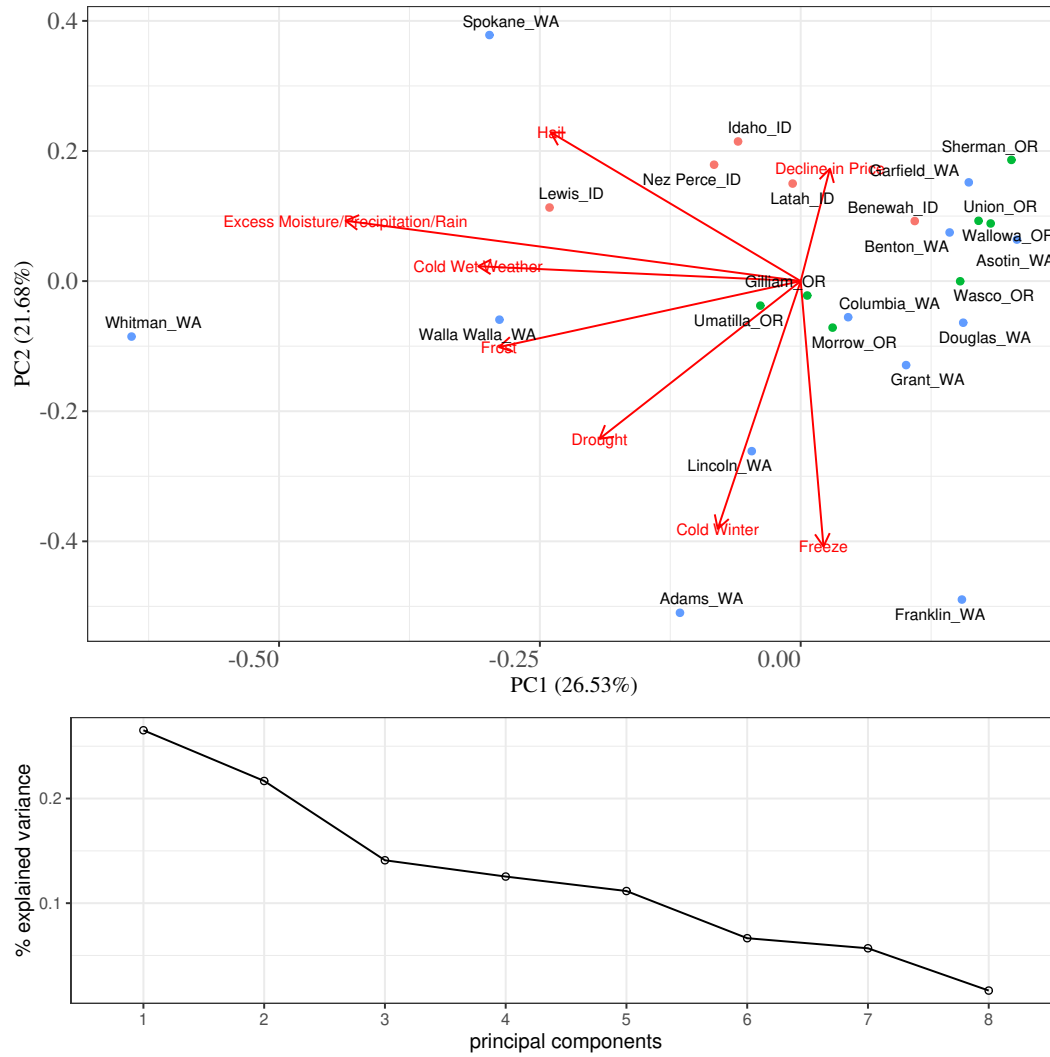
## 6. Inland Pacific Northwest (iPNW) PCA Figures



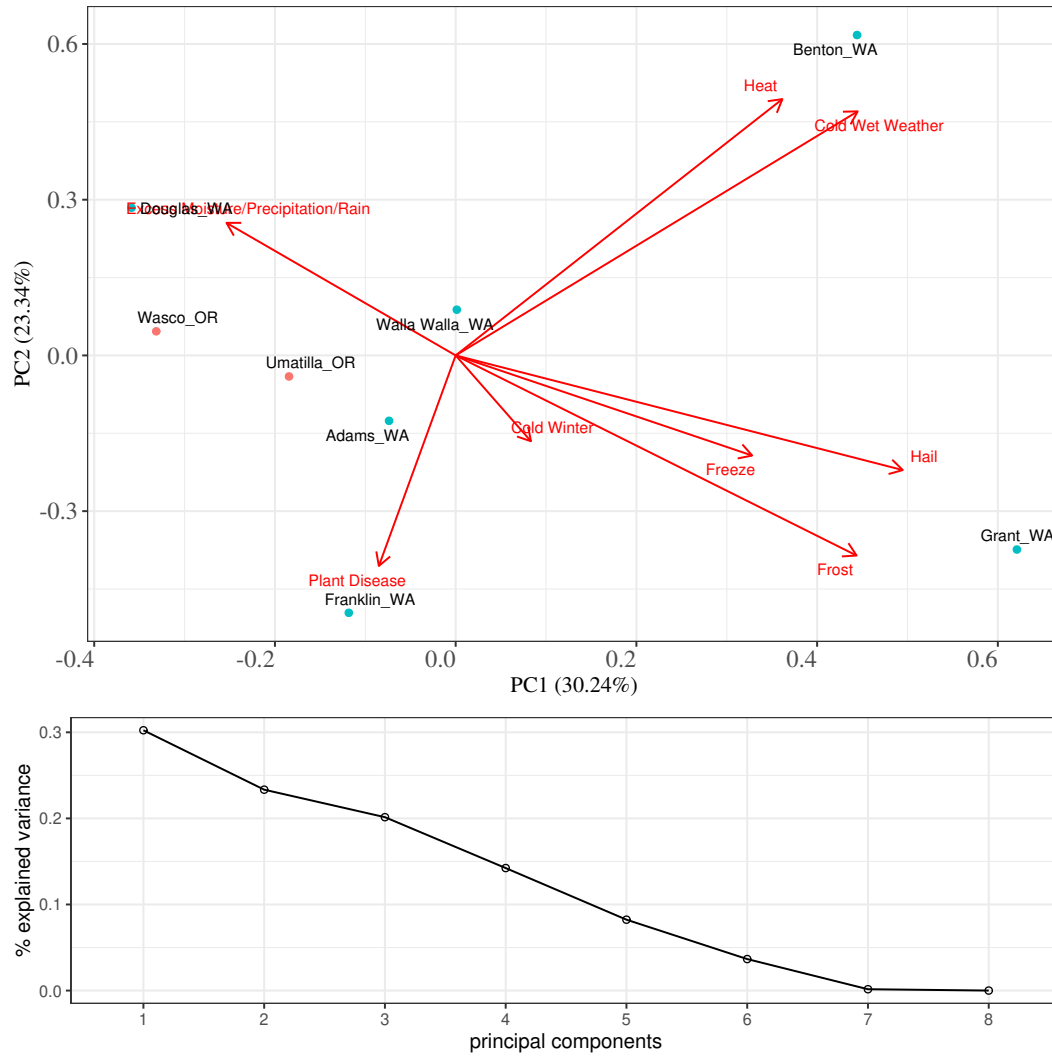
**Figure S 15.** Top panel: biplot of insurance loss for the inland PNW, for all commodities by county, with damage cause as the factor loadings. Bottom panel: Scree plot. Data from 2001 to 2022 is used.



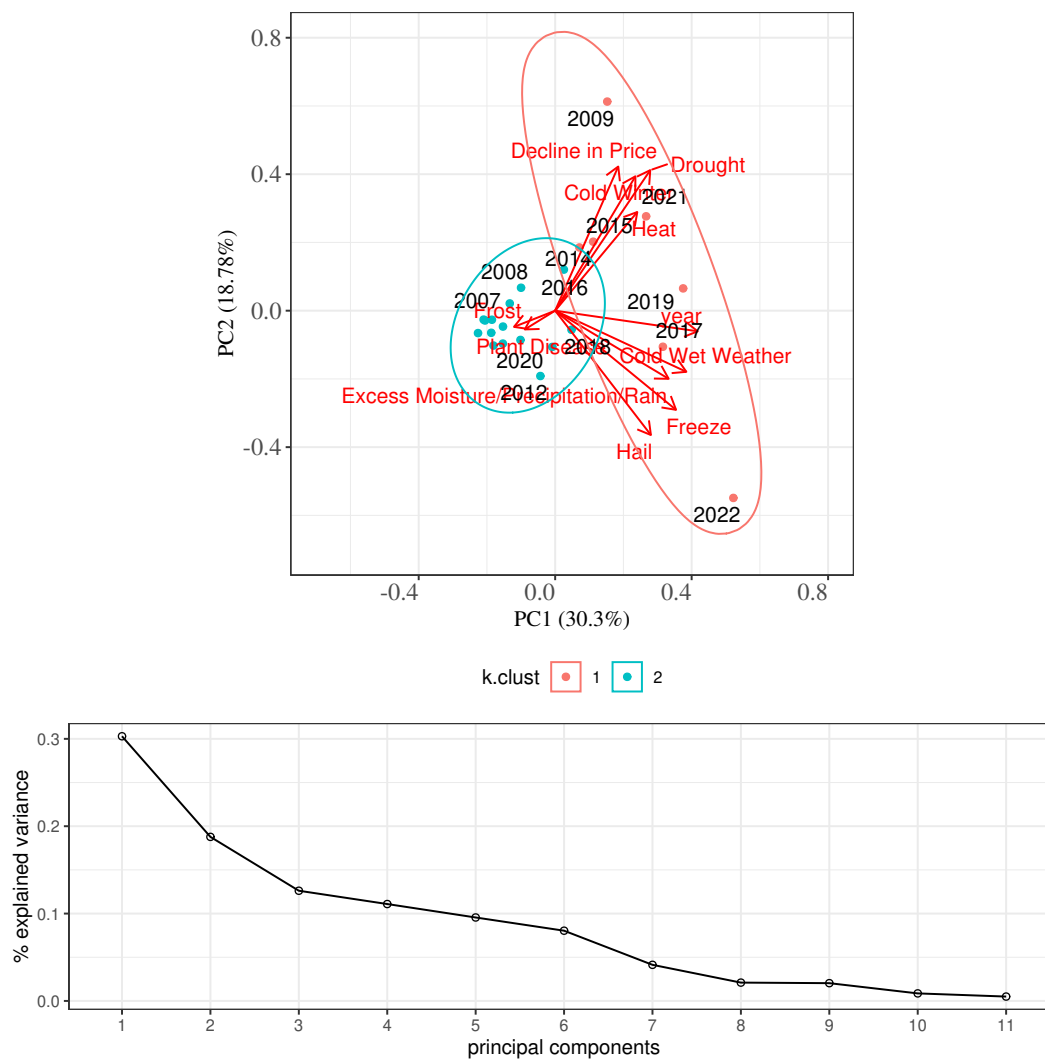
**Figure S 16.** Top panel: biplot of principal components for insurance loss for the entire iPNW, for all commodities by month, with damage cause as the factor loadings. Bottom panel: Scree plot Data from 2001 is 2022 is used.



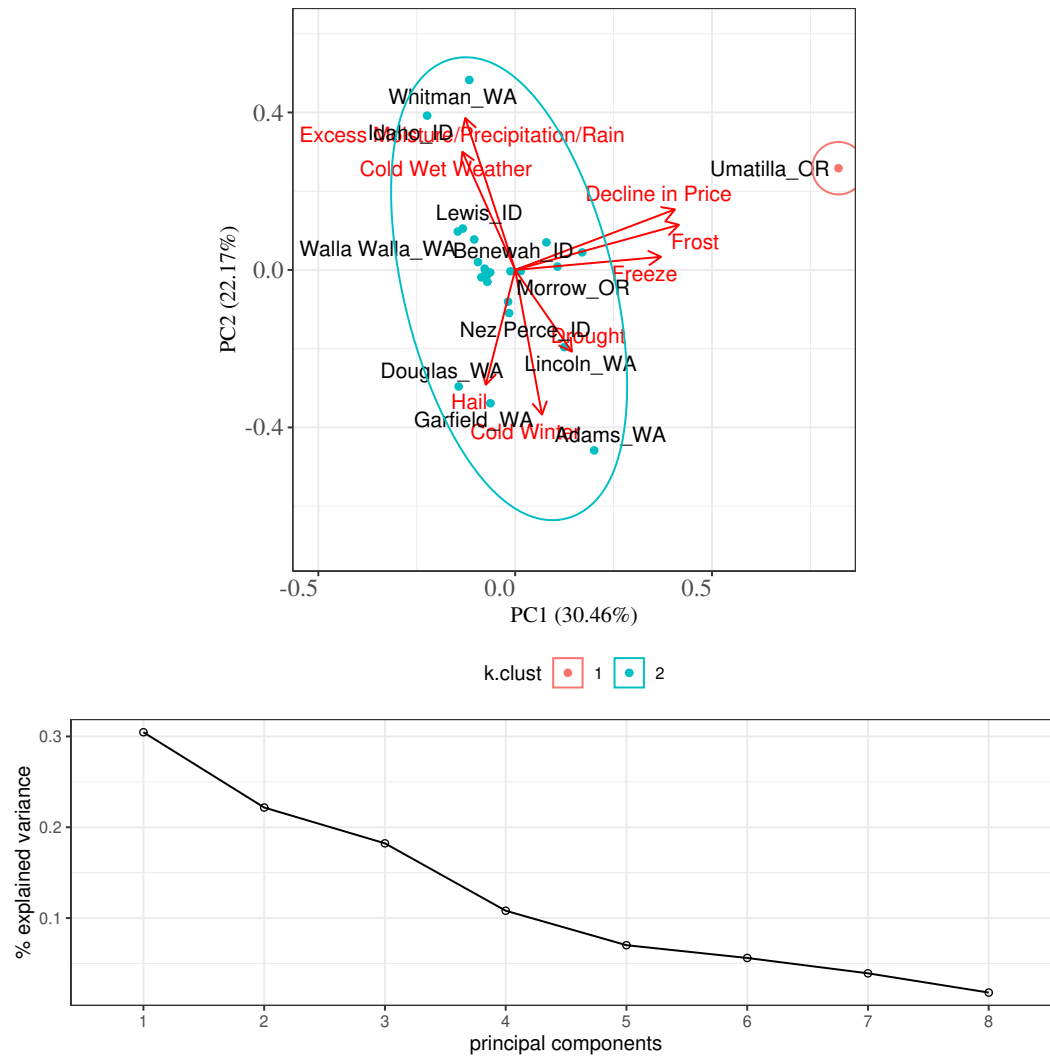
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**Figure S 18.** Top panel: biplot of insurance loss for the entire iPNW, for apples by county, with damage cause as the factor loadings. Bottom panel: Scree plot. Data from 2001 is 2022 is used.

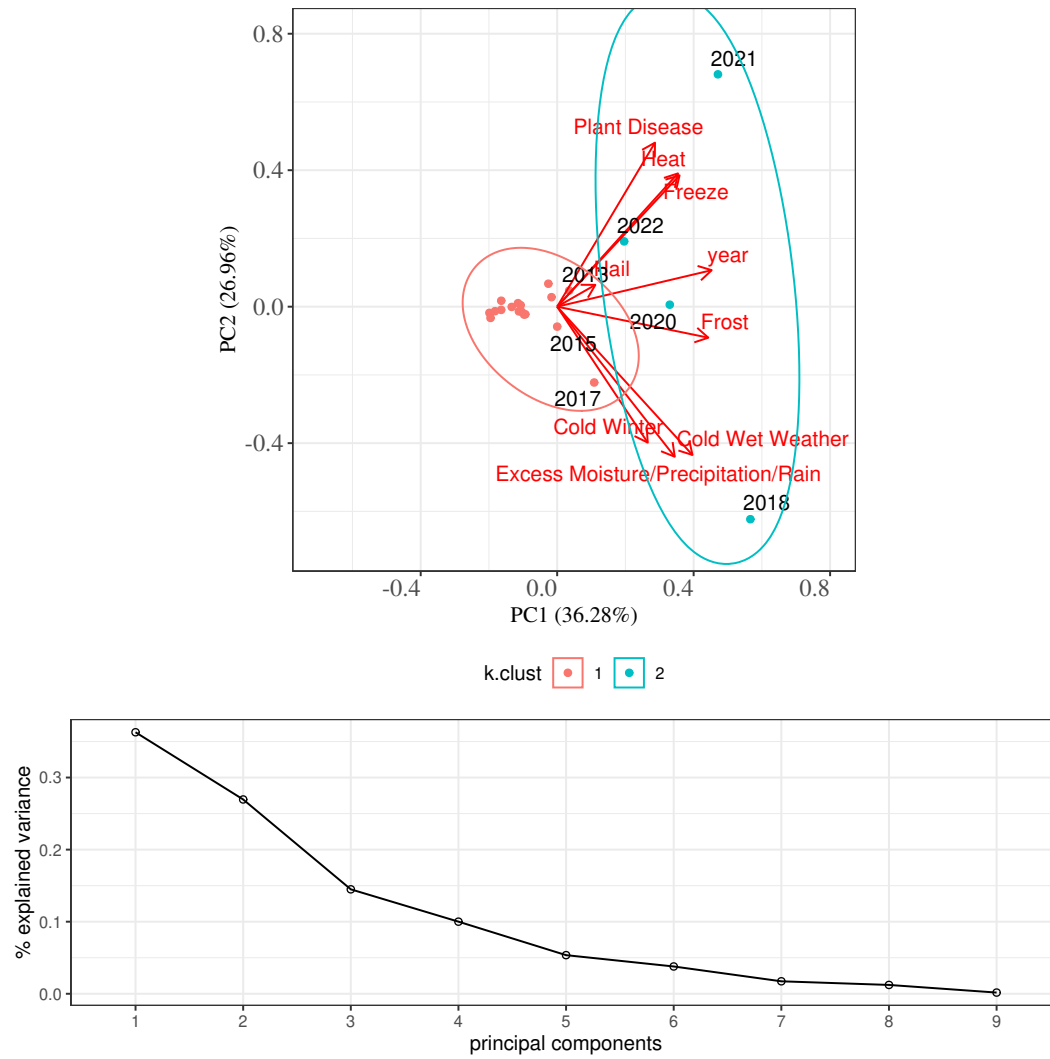


**Figure S 19.** Top panel: biplot of insurance loss for the entire iPNW, for wheat by year, with damage cause as the factor loadings. Bottom panel: Scree plot. Data from 2001 is 2022 is used.

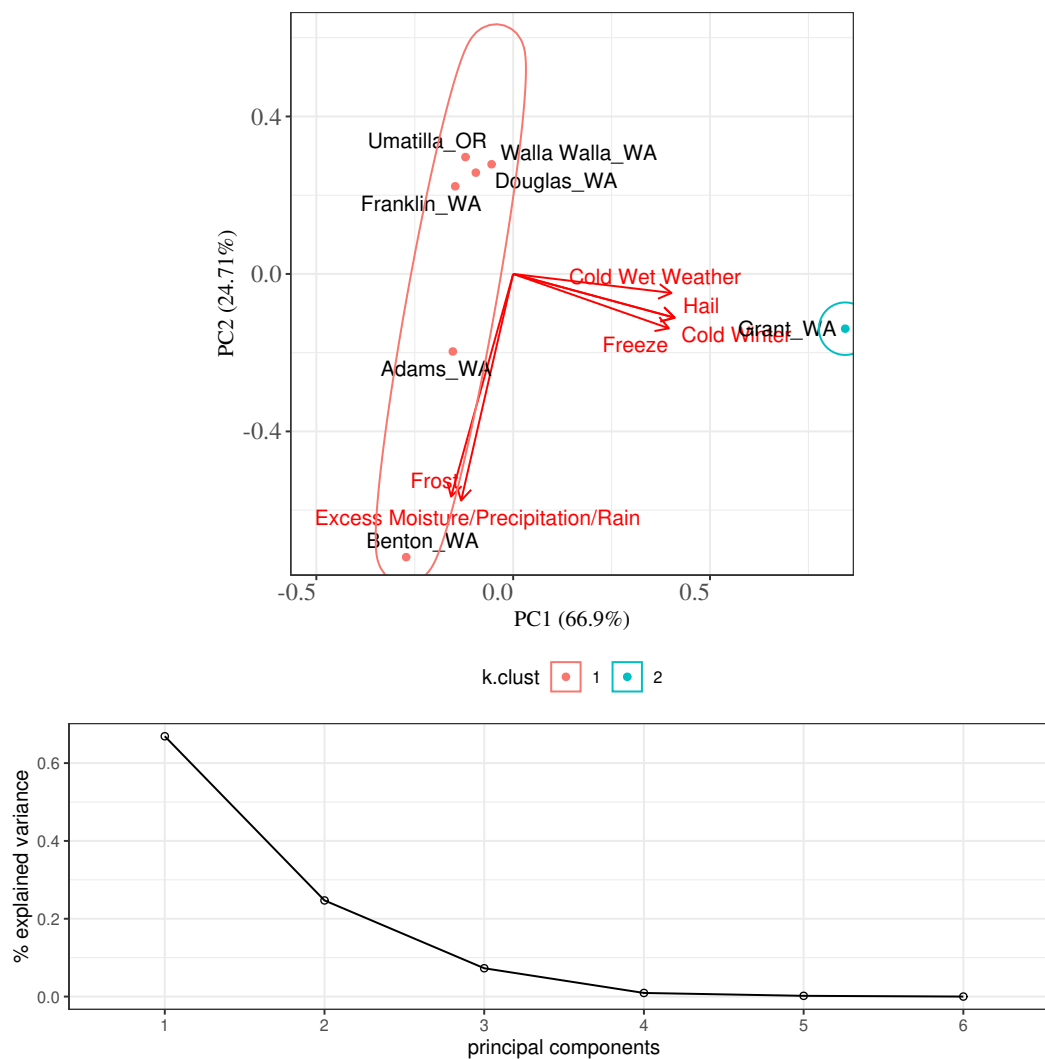


**Figure S 20.** Top panel: biplot of insurance loss for the iPNW, for wheat by county, with damage cause as the factor loadings. Uses a Kmeans technique for grouping. Bottom panel: Scree plot. Data from 2001 is 2022 is used.





**Figure S 21.** Top panel: biplot of insurance loss for the entire iPNW, for wheat by year, with damage cause as the factor loadings. Bottom panel: Scree plot. Data from 2001 to 2022 is used.



**Figure S 22.** Top panel: biplot of insurance loss for the iPNW, for wheat by county, with damage cause as the factor loadings. Uses a Kmeans technique for grouping. Bottom panel: Scree plot. Data from 2001 is 2022 is used.