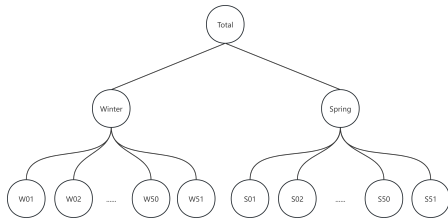


Supplement to “Quantifying and Pricing Crop Yield Risk under Climate Change: A Hierarchical Model Forecasting Perspective (AAS-2025-0044)”

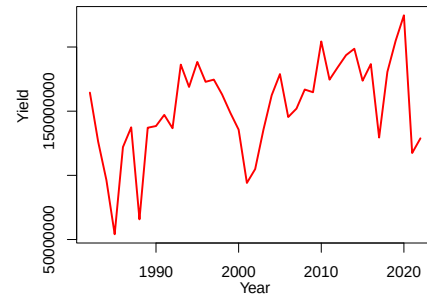
Anonymous Authors

April 2, 2026

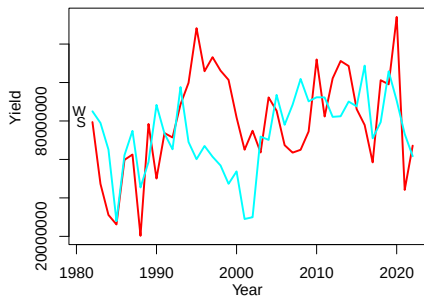
1 Additional Yield Visualizations



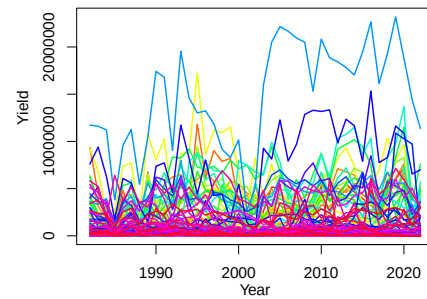
(a) Hierarchical structure of crop yield



(b) State-level yield data



(c) Winter and spring wheat yield



(d) County-level yield

Figure 1: hierarchical crop yield

2 Wheat Yield Risk Map (Overall-PC)

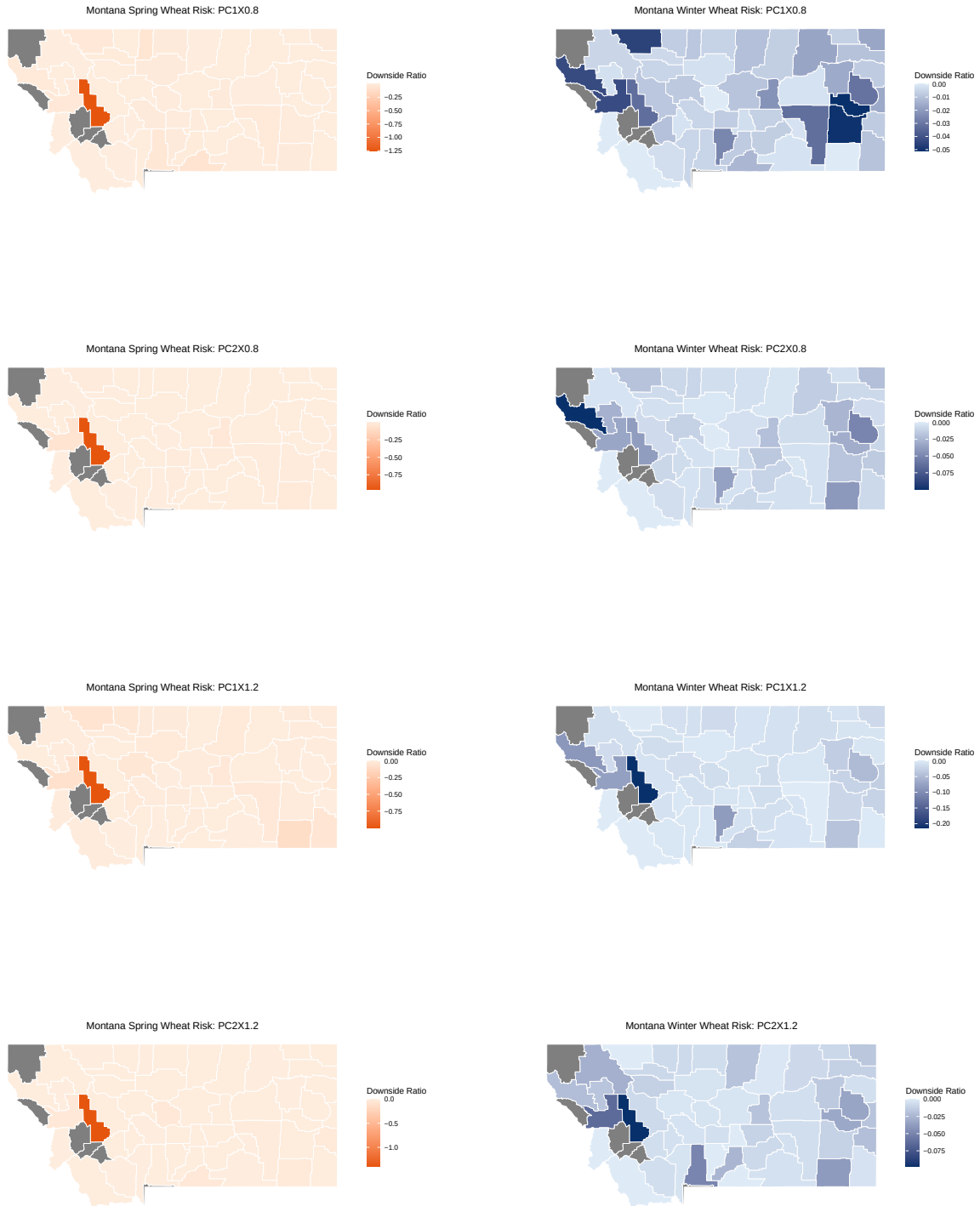


Figure 2: Montana County Spring/Winter Wheat Risk Maps($\pm 20\%$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

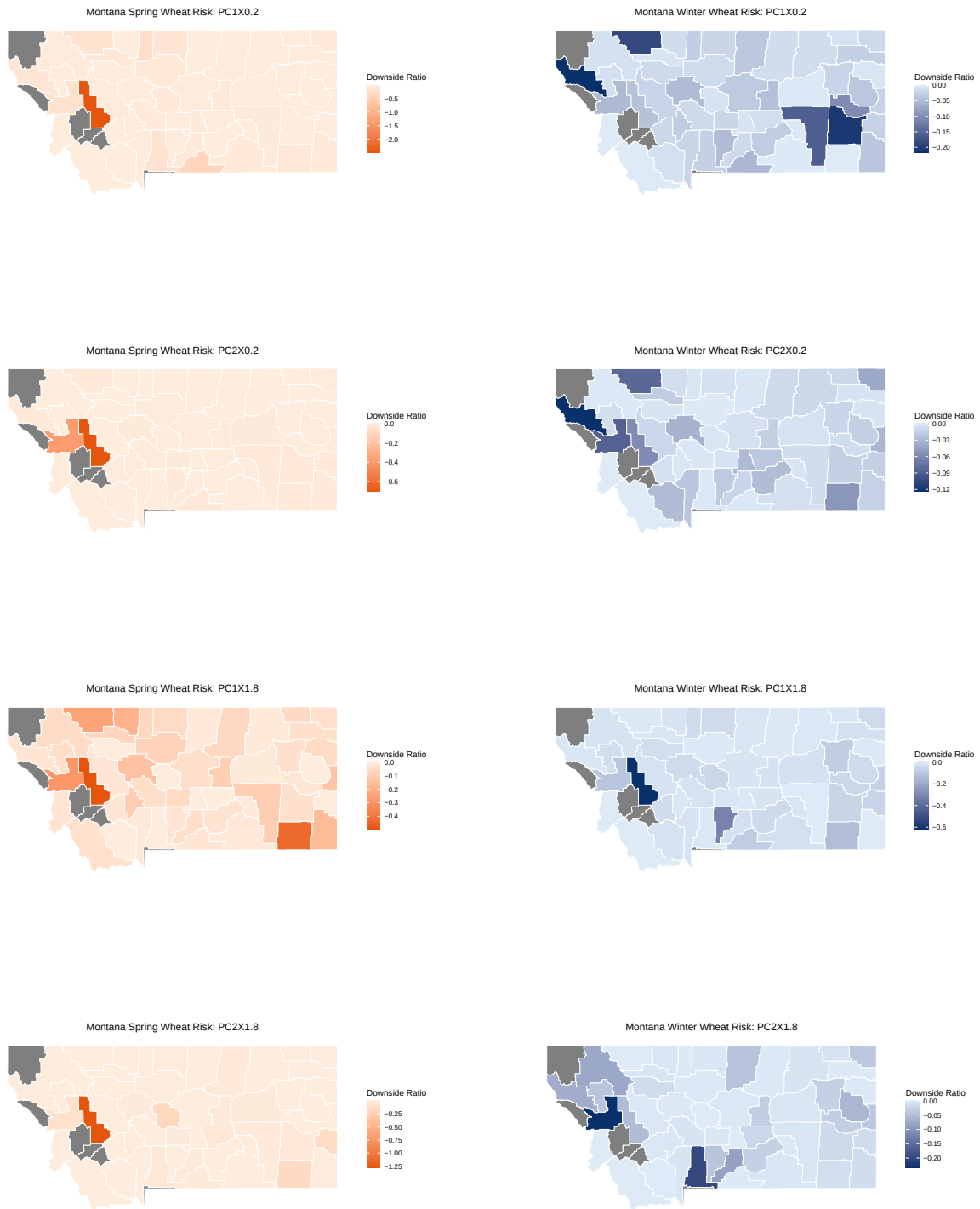


Figure 3: Montana County Spring/Winter Wheat Risk Maps($\pm 80\%$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

3 Wheat Yield Risk Map (Top-loading-variable)

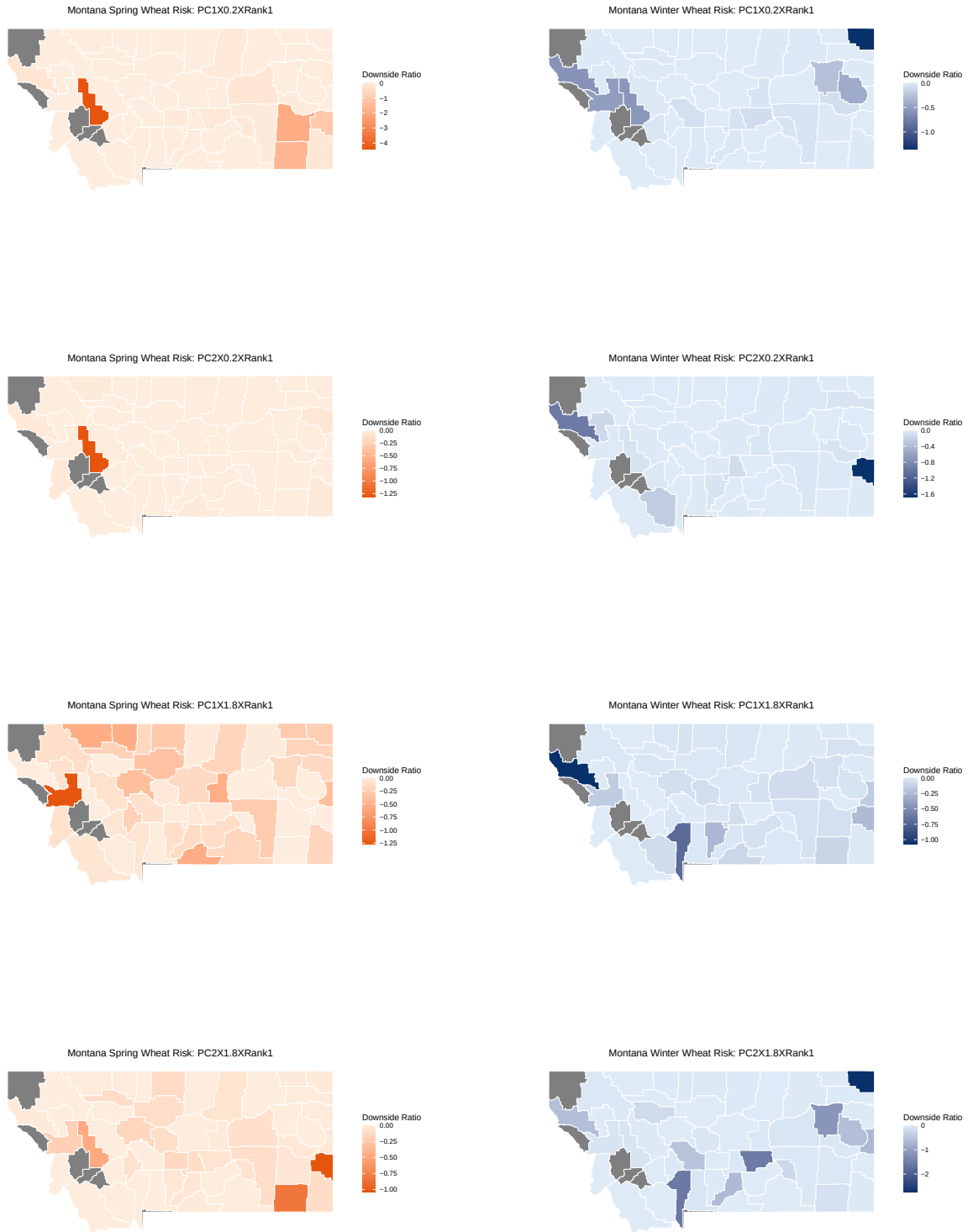


Figure 4: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 1$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

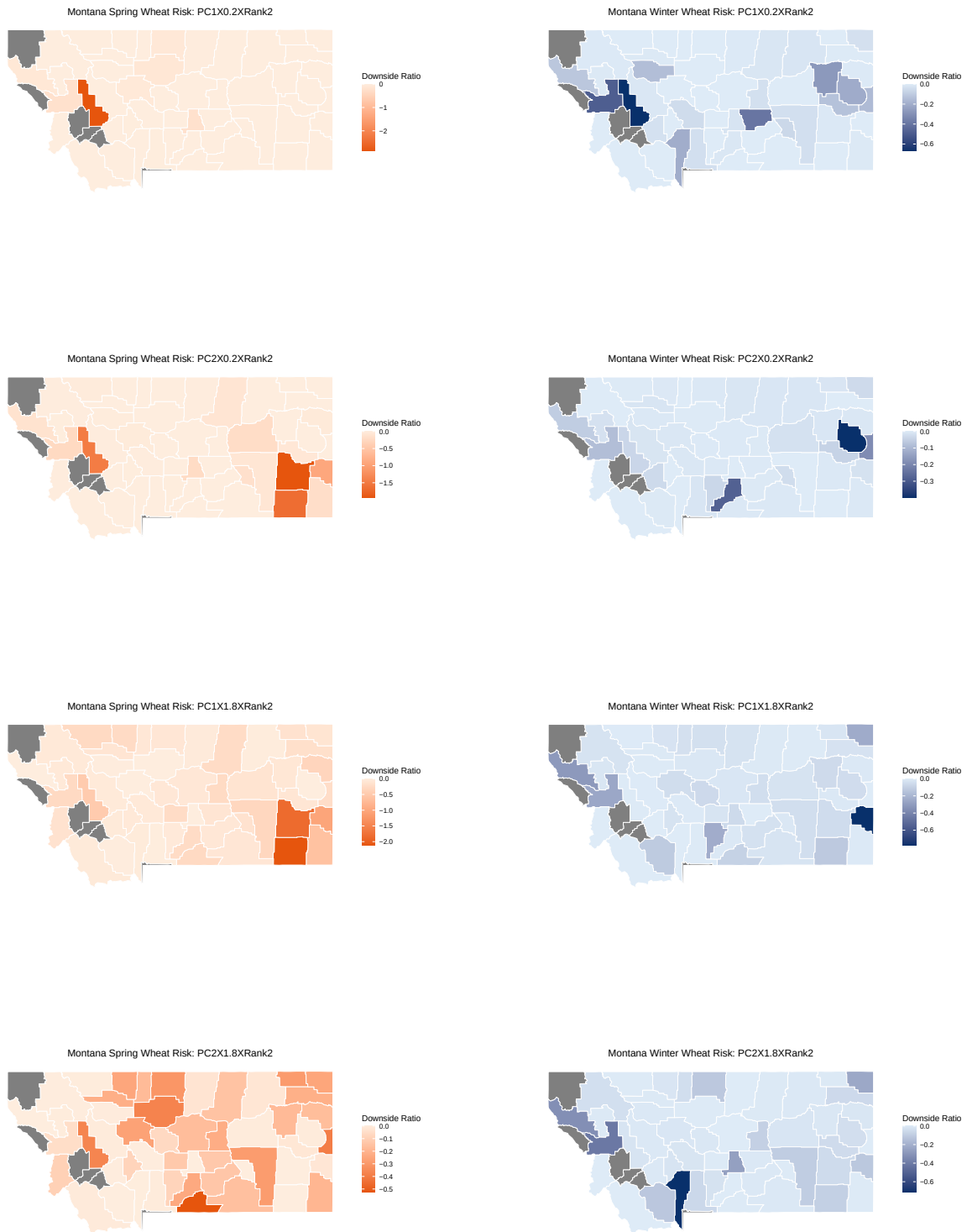


Figure 5: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 2$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

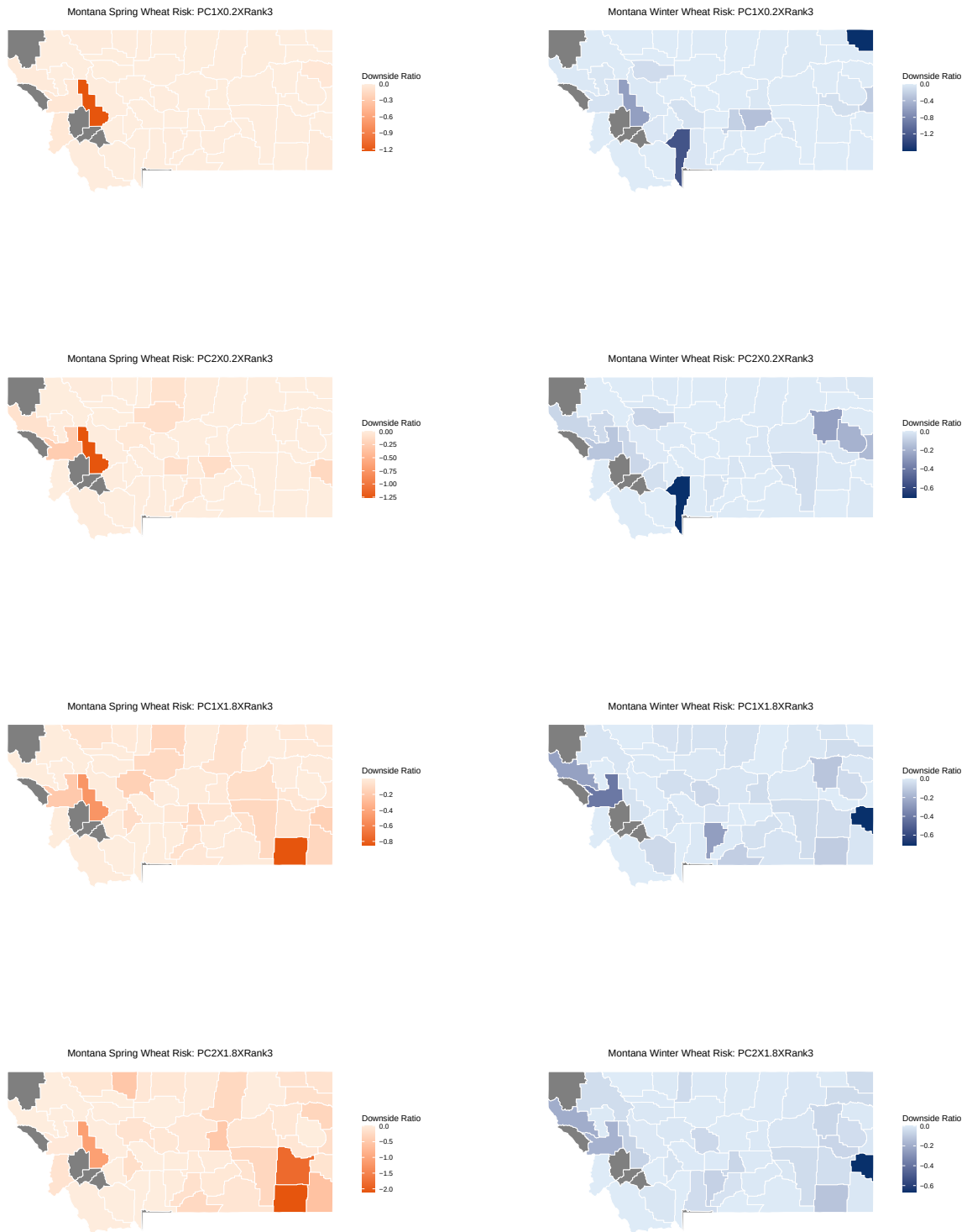


Figure 6: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 3$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

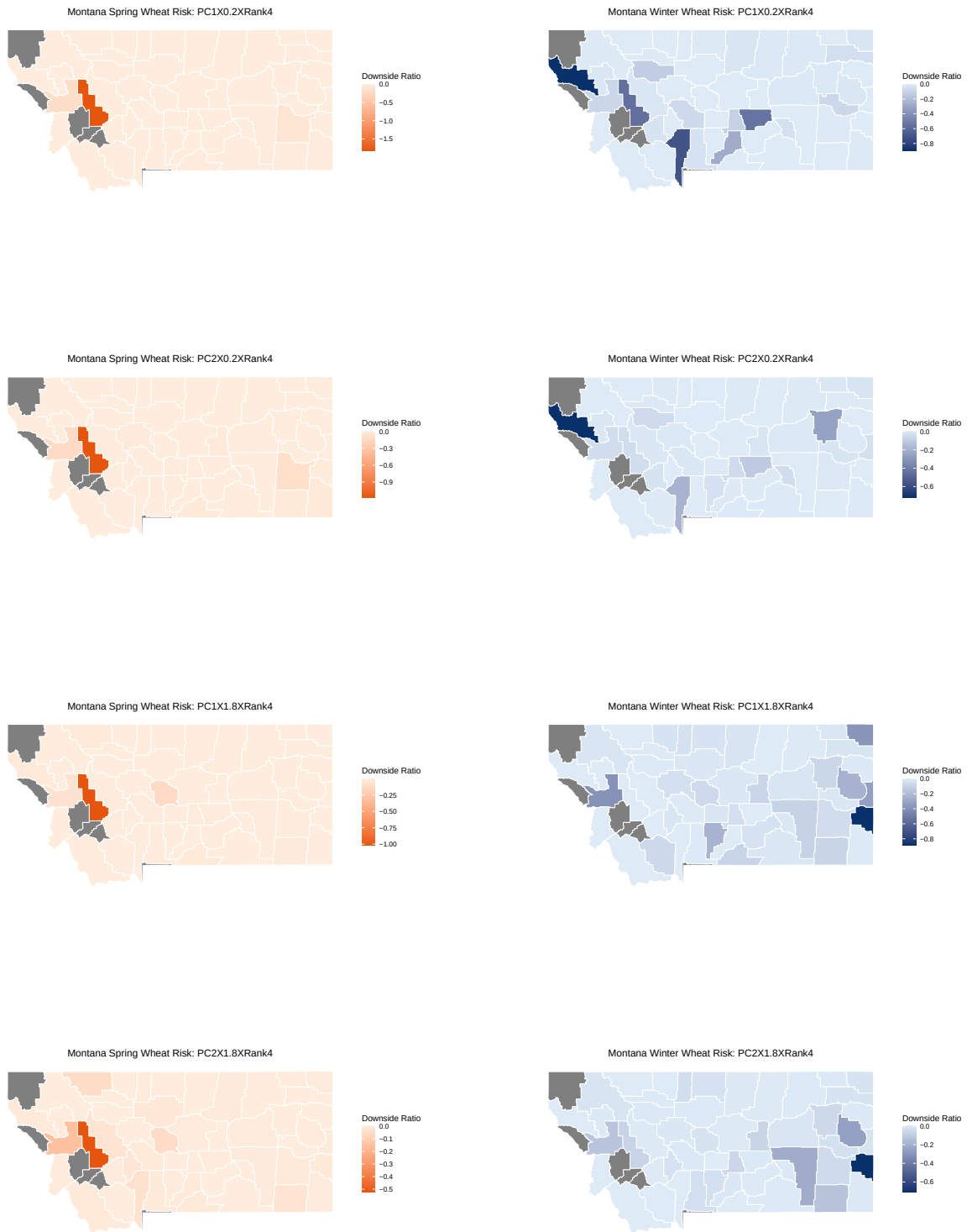


Figure 7: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 4$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

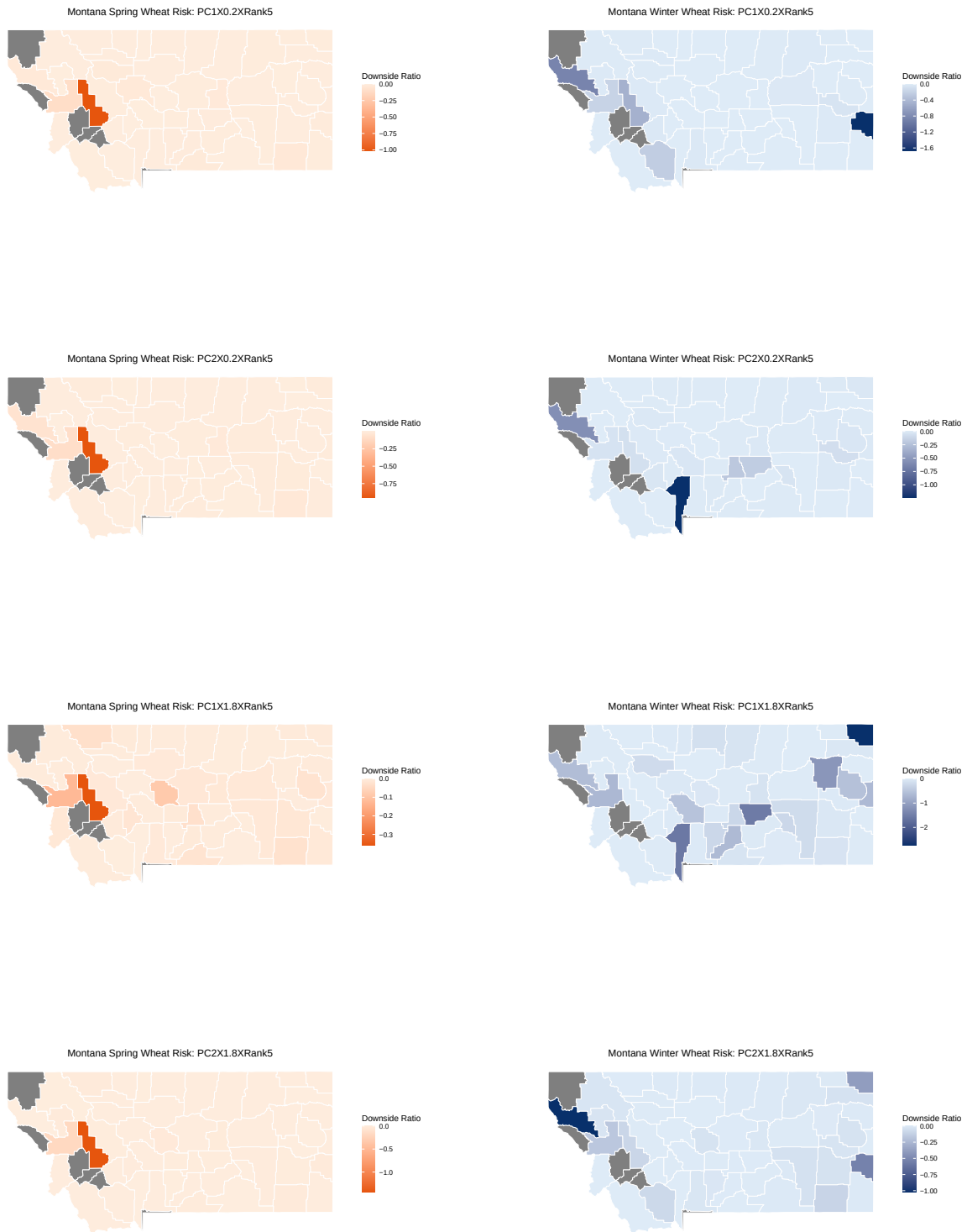


Figure 8: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 5$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

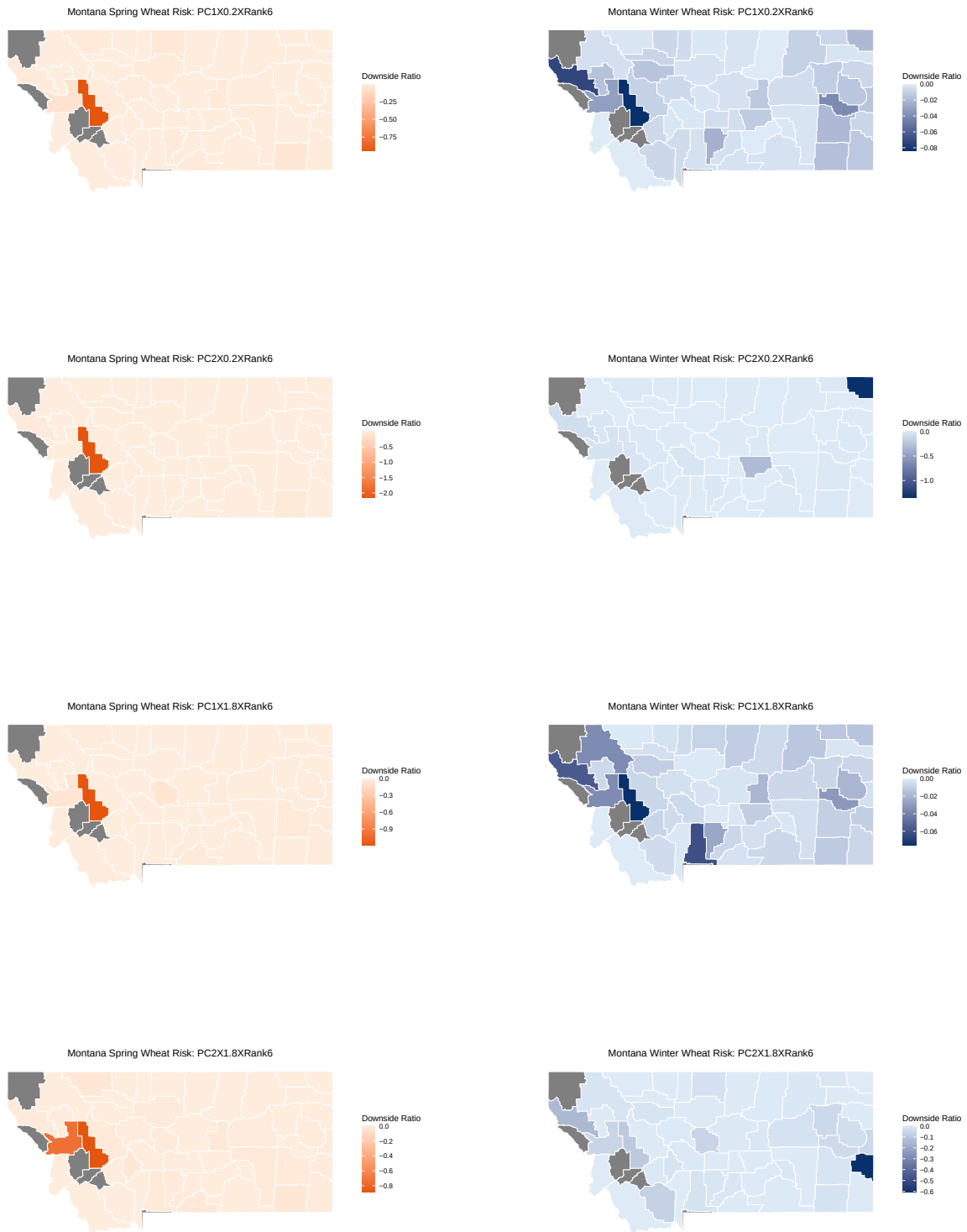


Figure 9: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 6$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

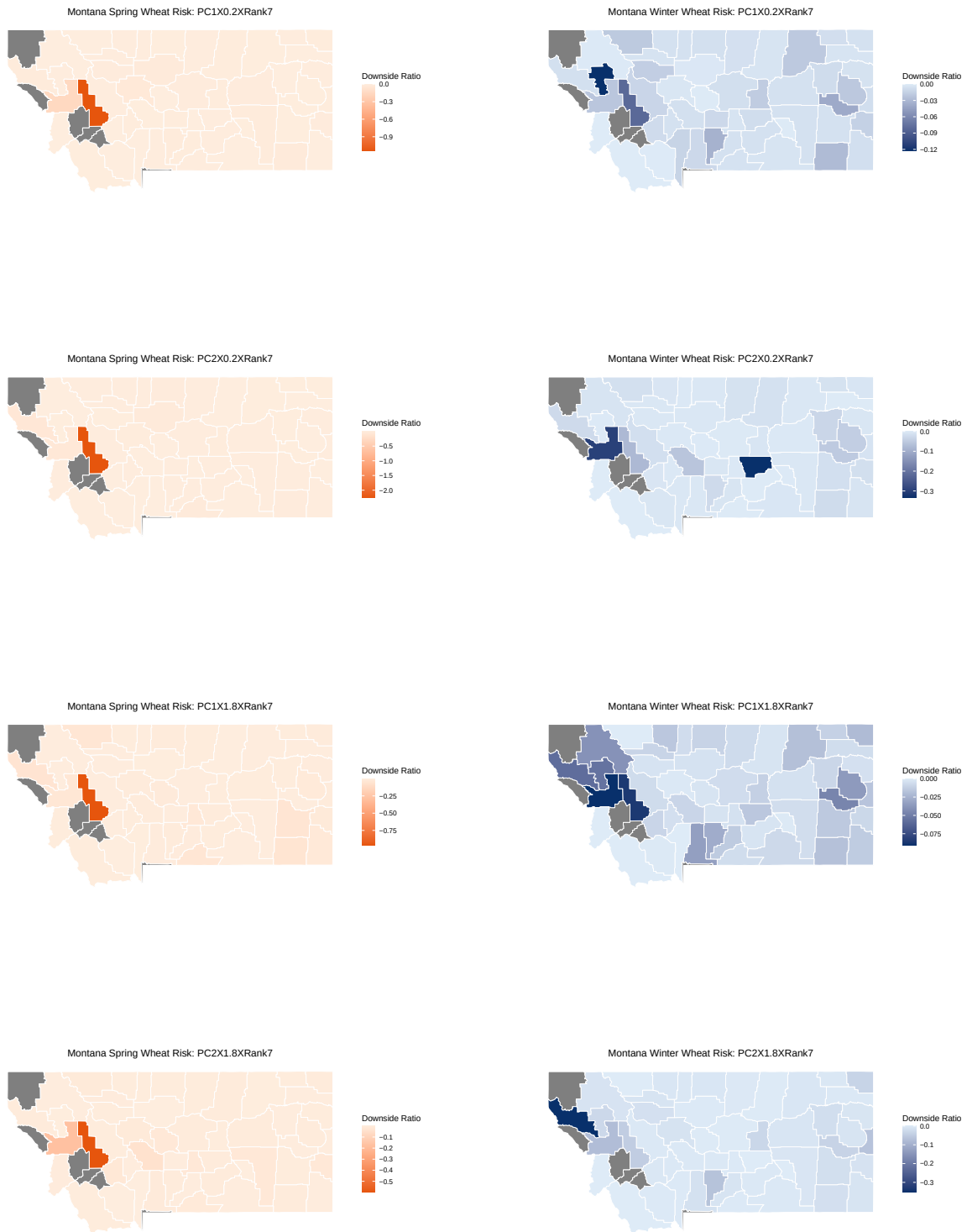


Figure 10: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 7$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

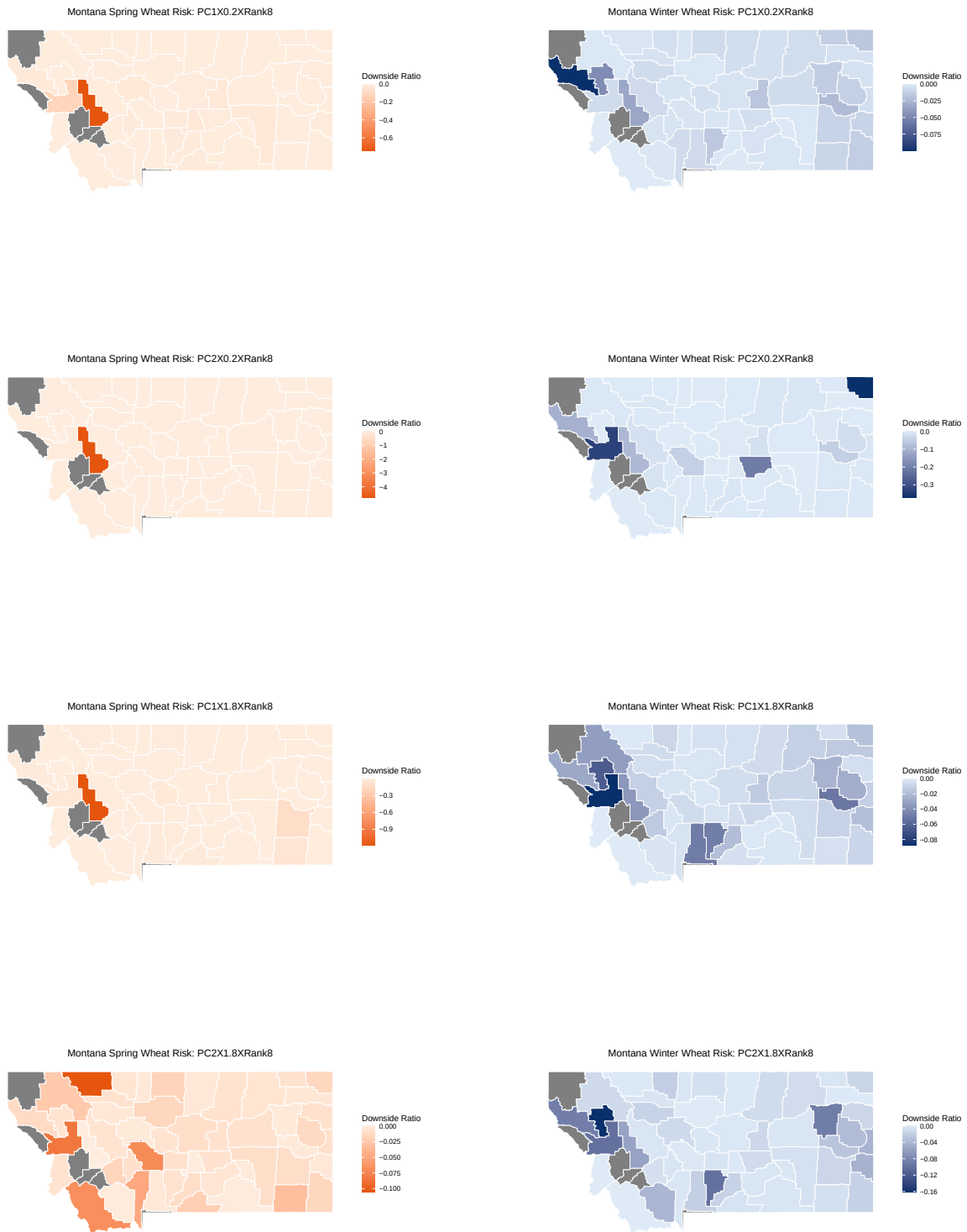


Figure 11: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 8$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

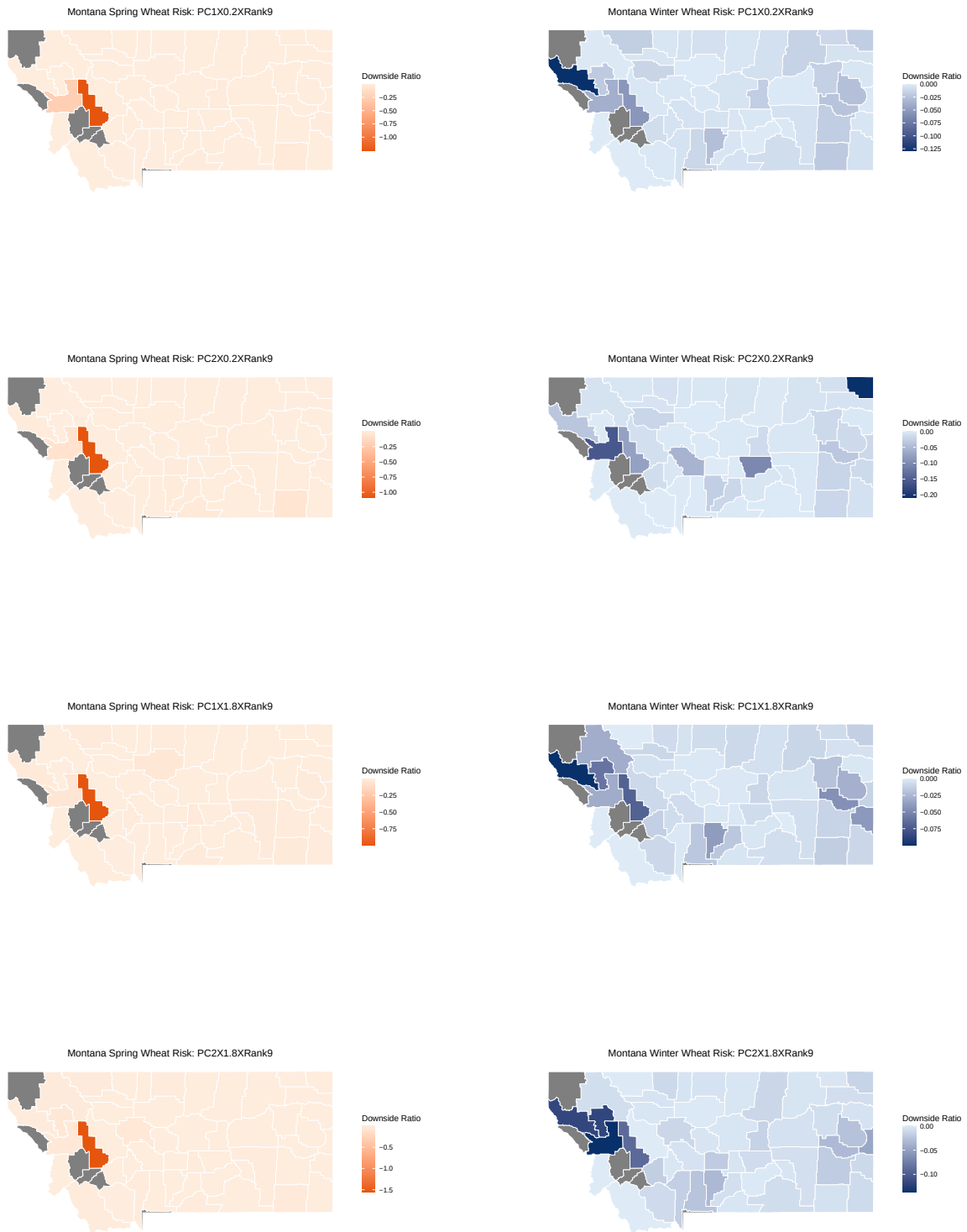


Figure 12: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 9$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

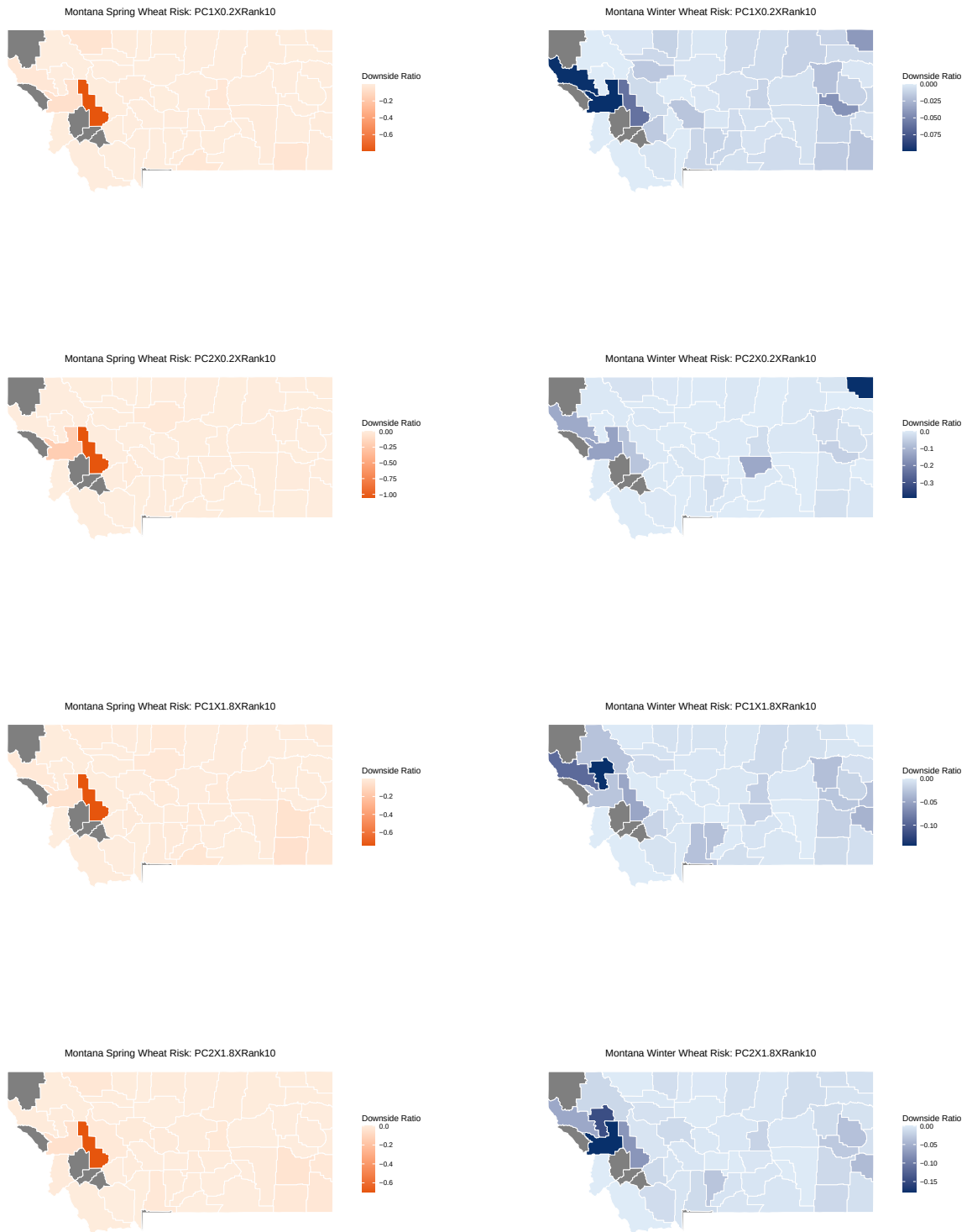


Figure 13: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 80\%$, $Rank = 10$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

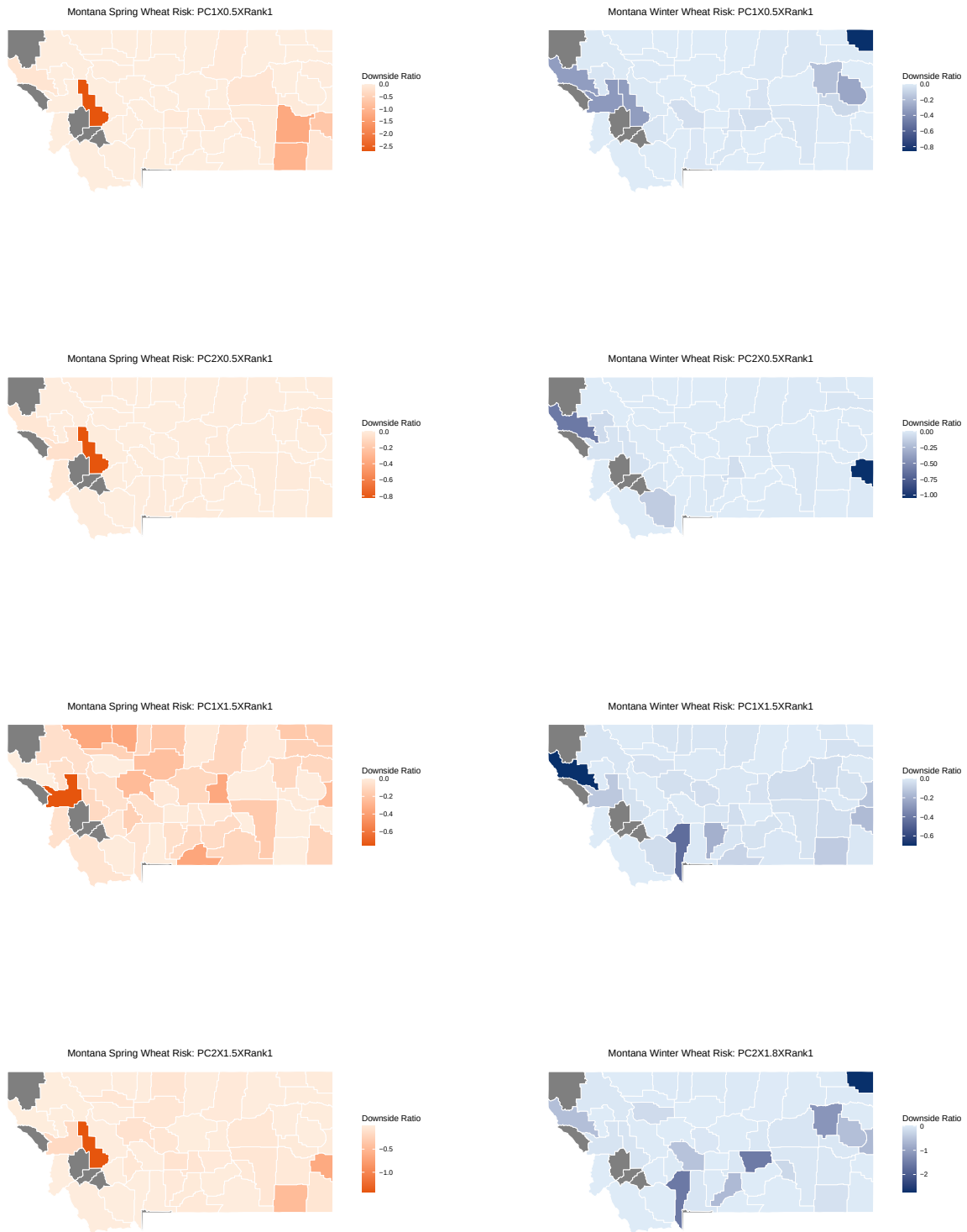


Figure 14: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 1$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

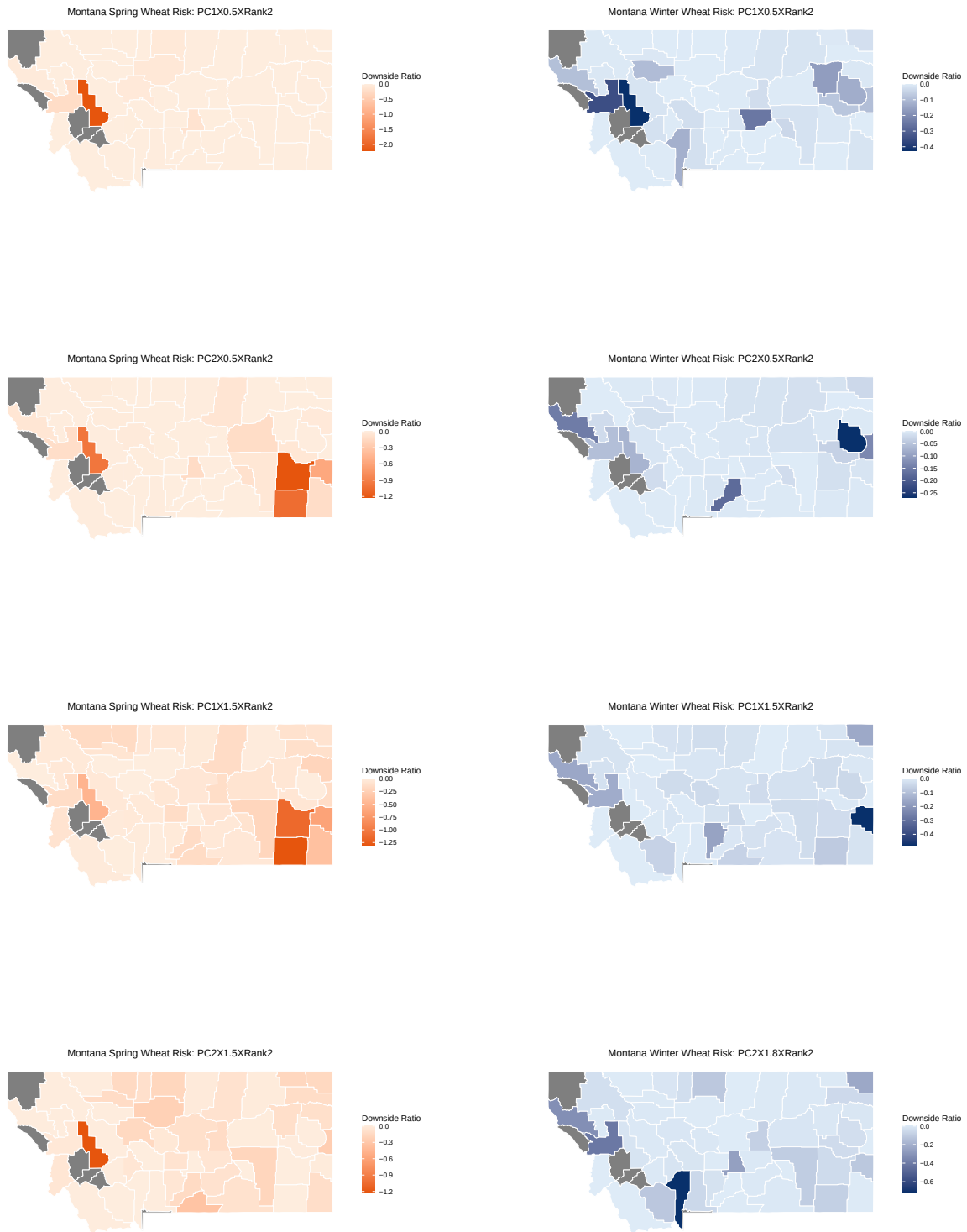


Figure 15: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 2$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

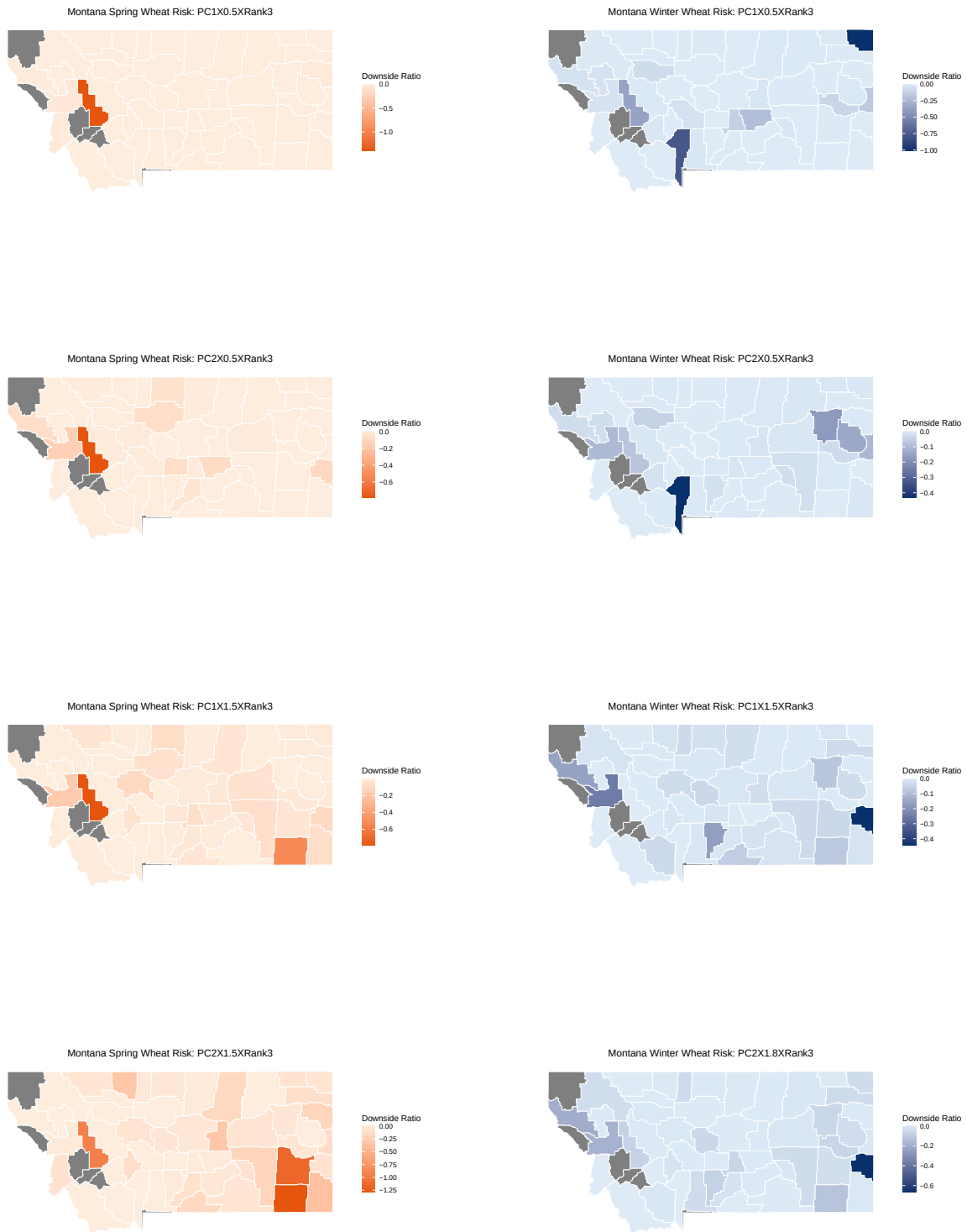


Figure 16: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 3$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

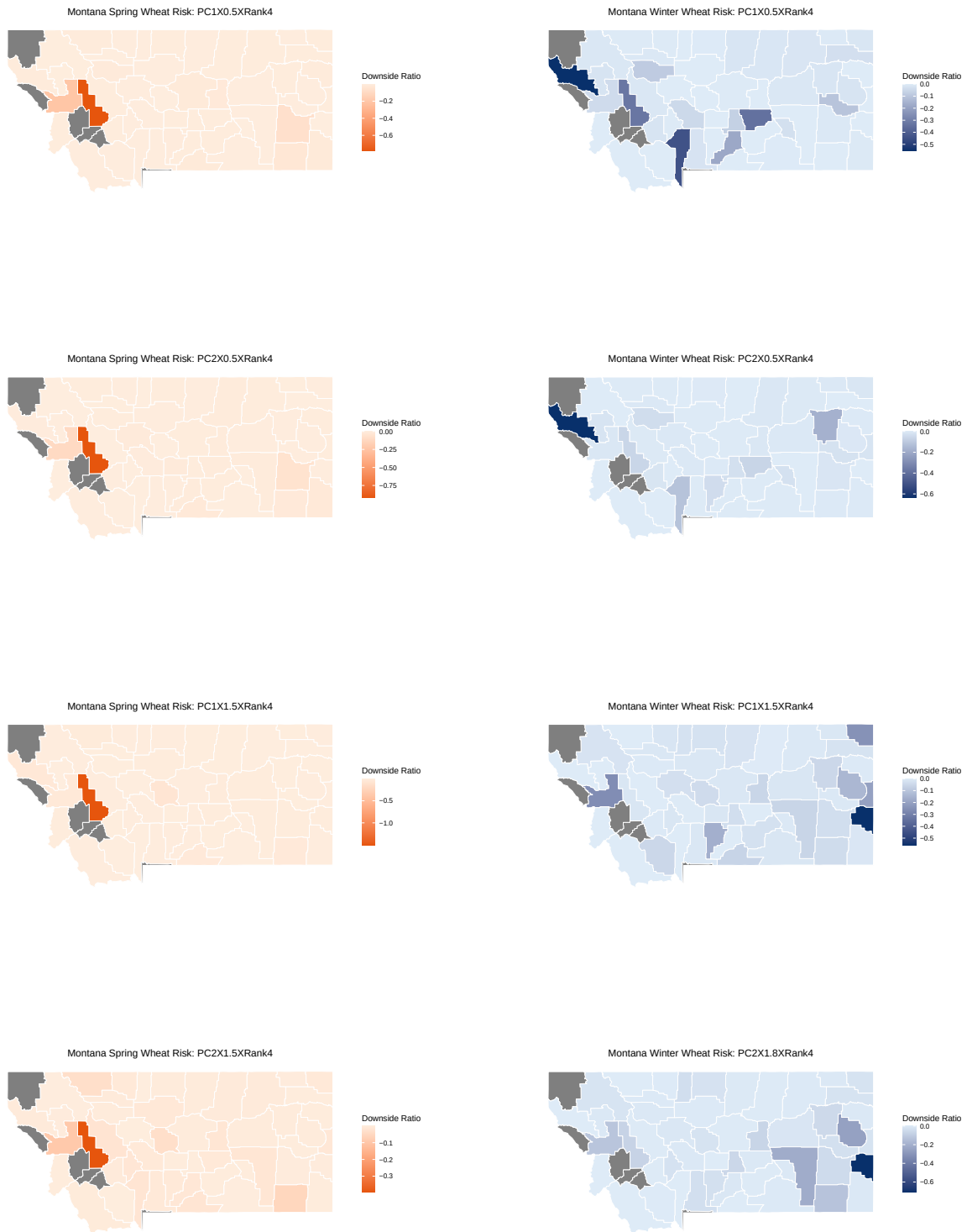


Figure 17: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 4$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

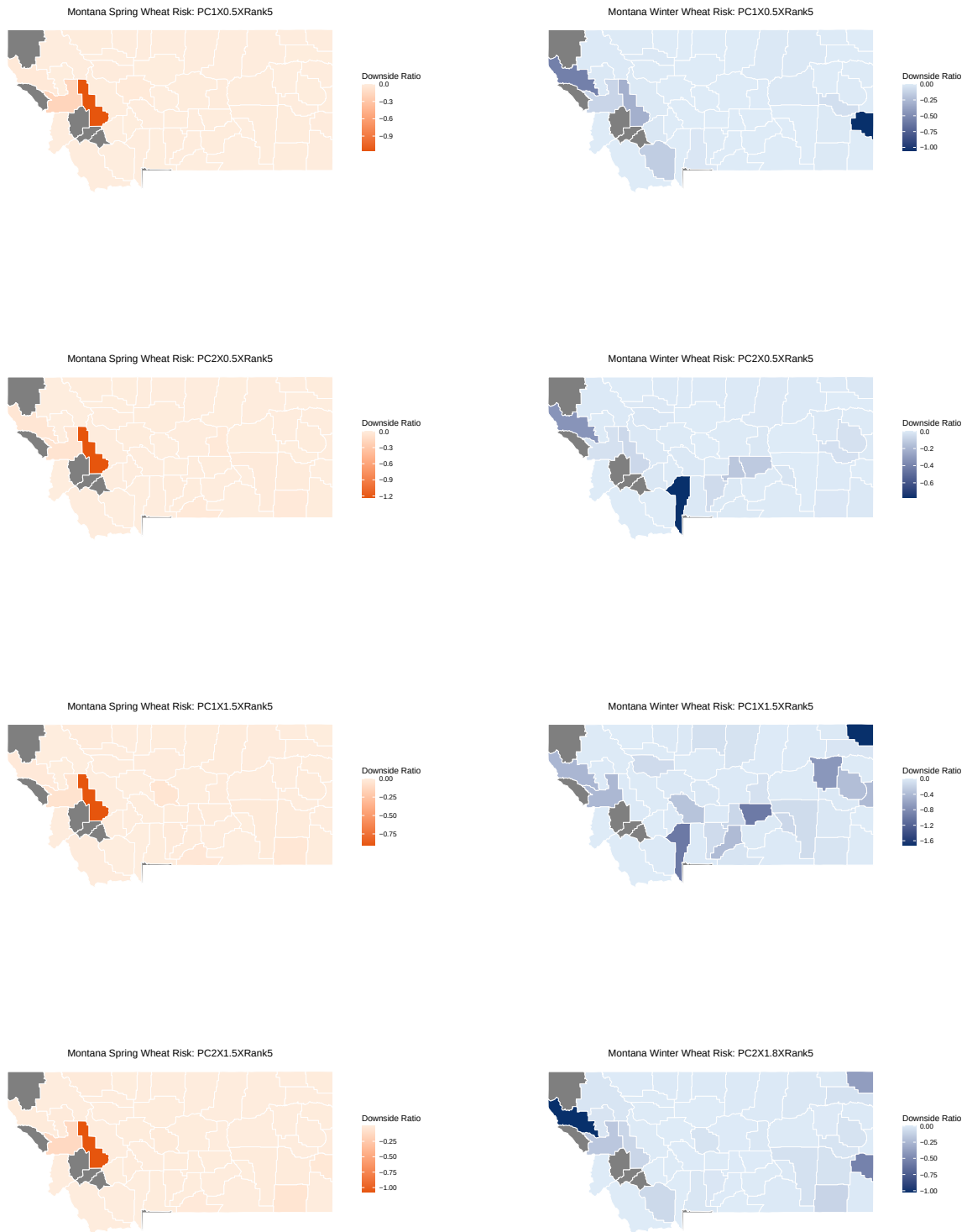


Figure 18: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 5$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

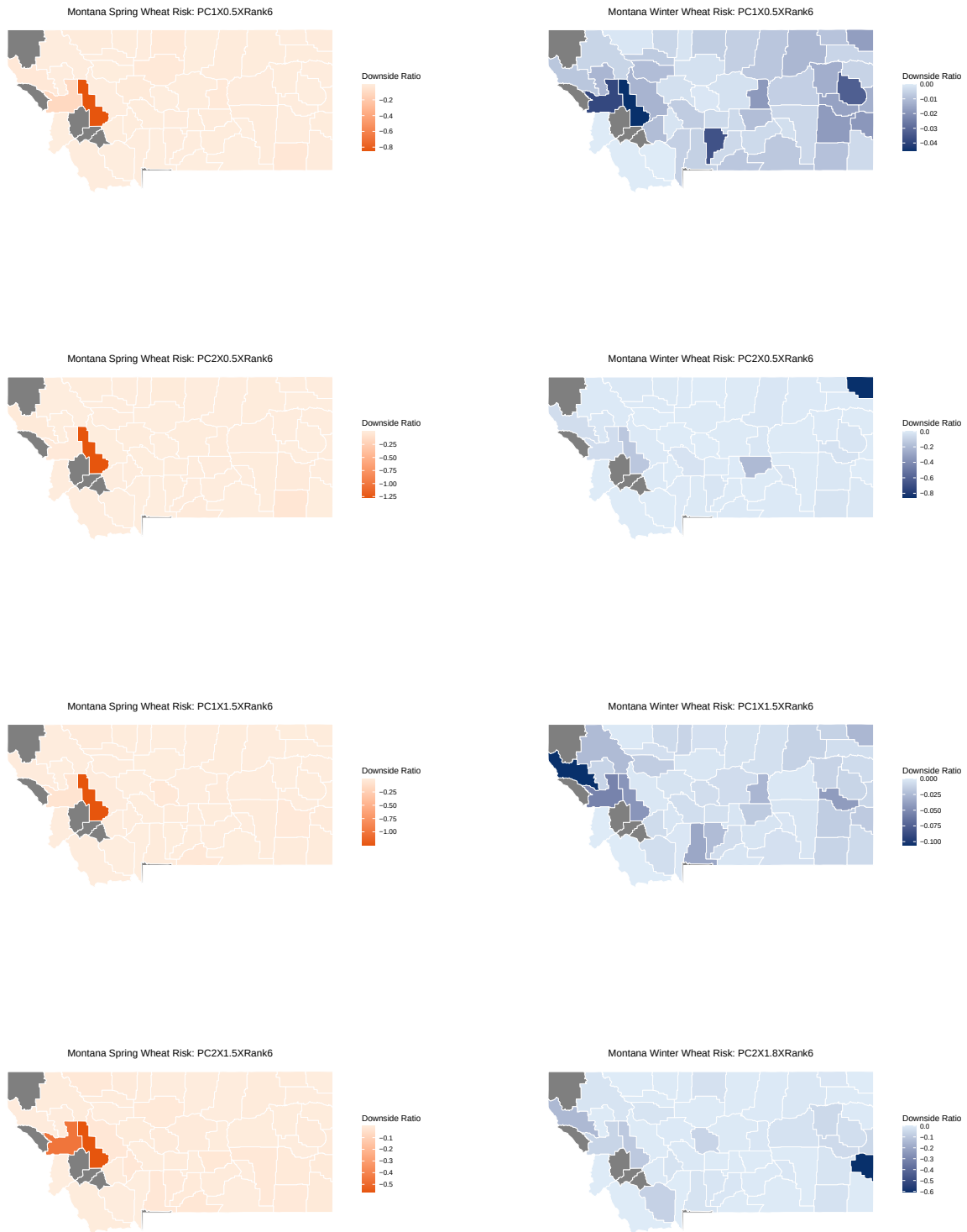


Figure 19: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 6$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

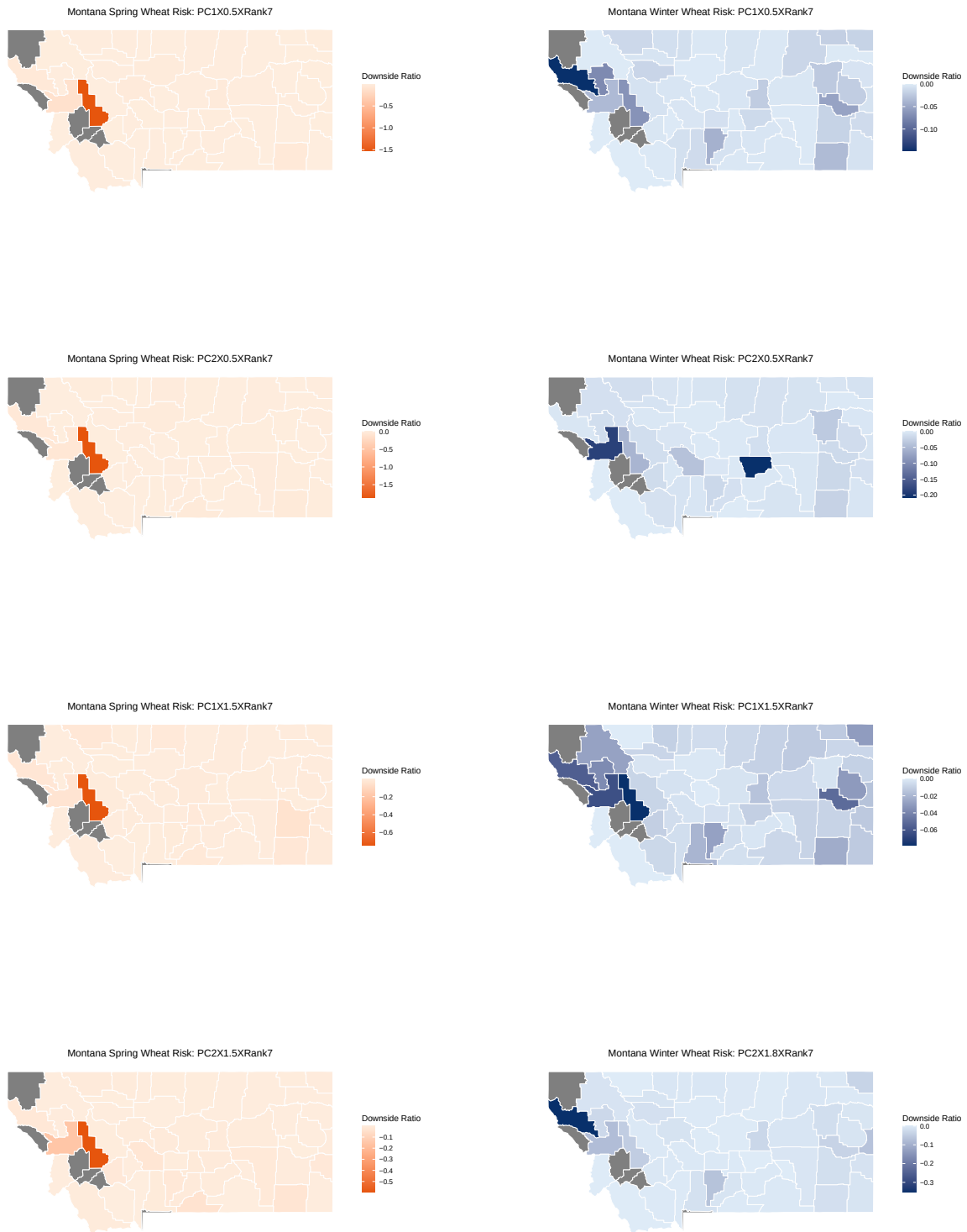


Figure 20: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 7$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

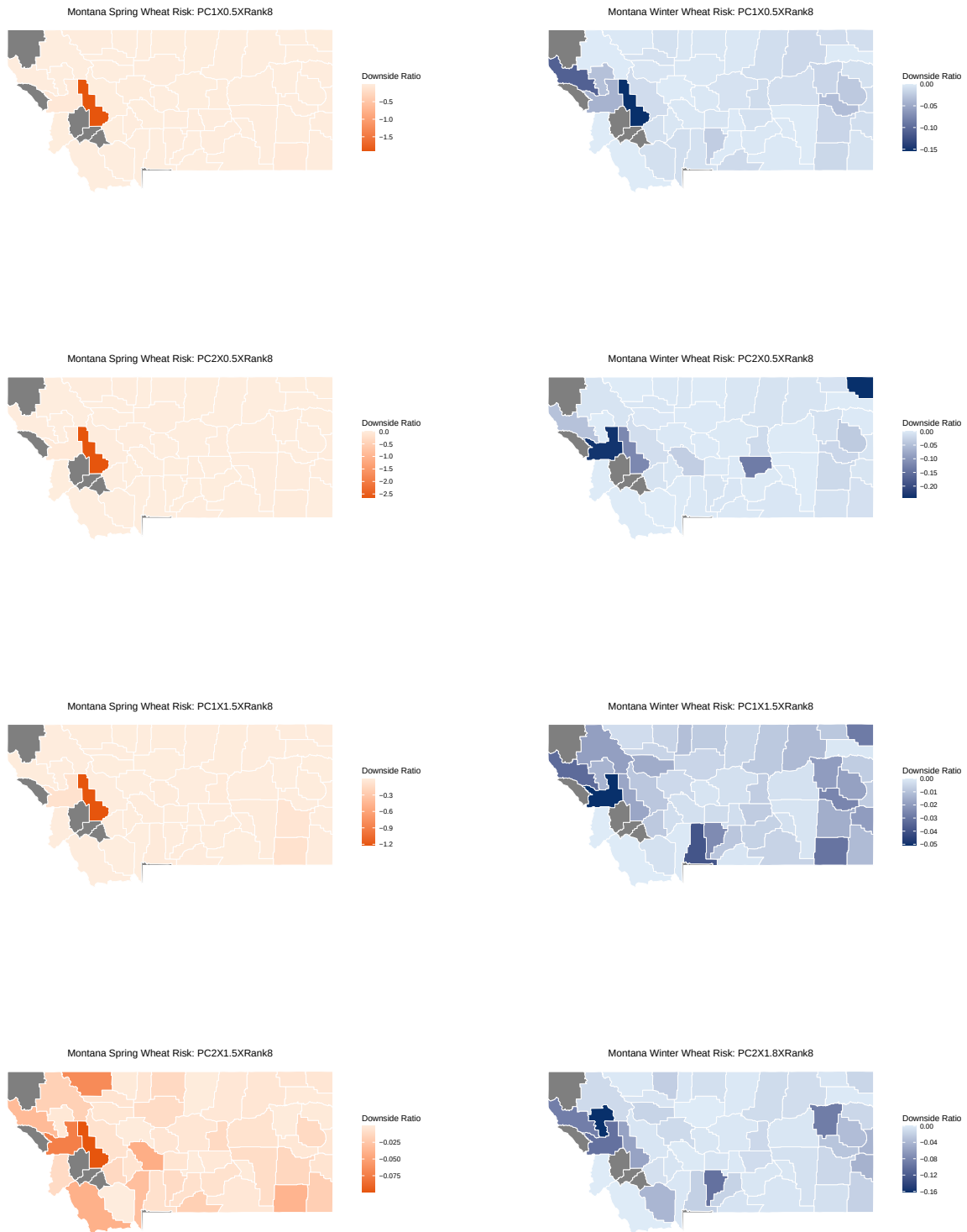


Figure 21: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 8$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

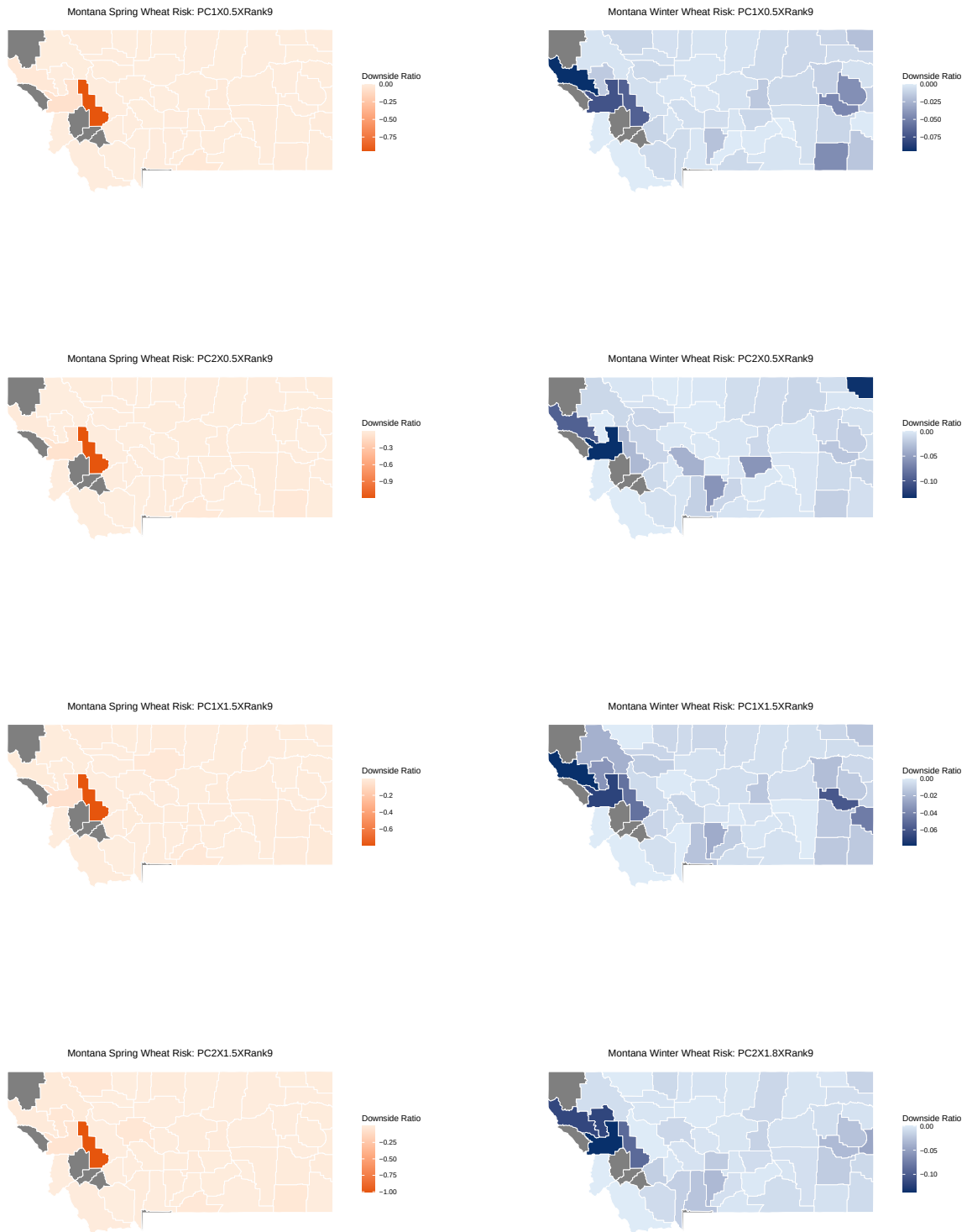


Figure 22: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 9$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

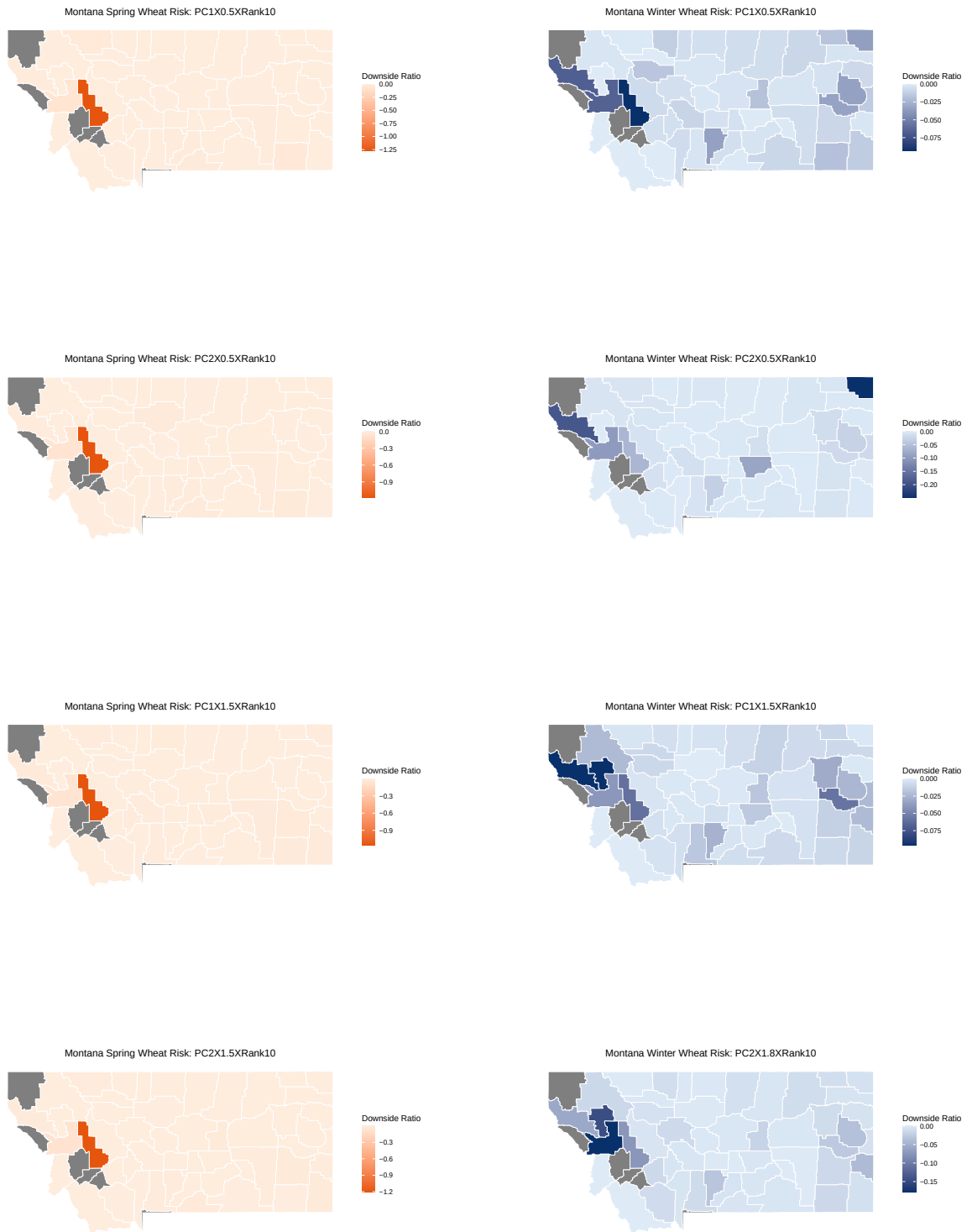


Figure 23: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 10$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

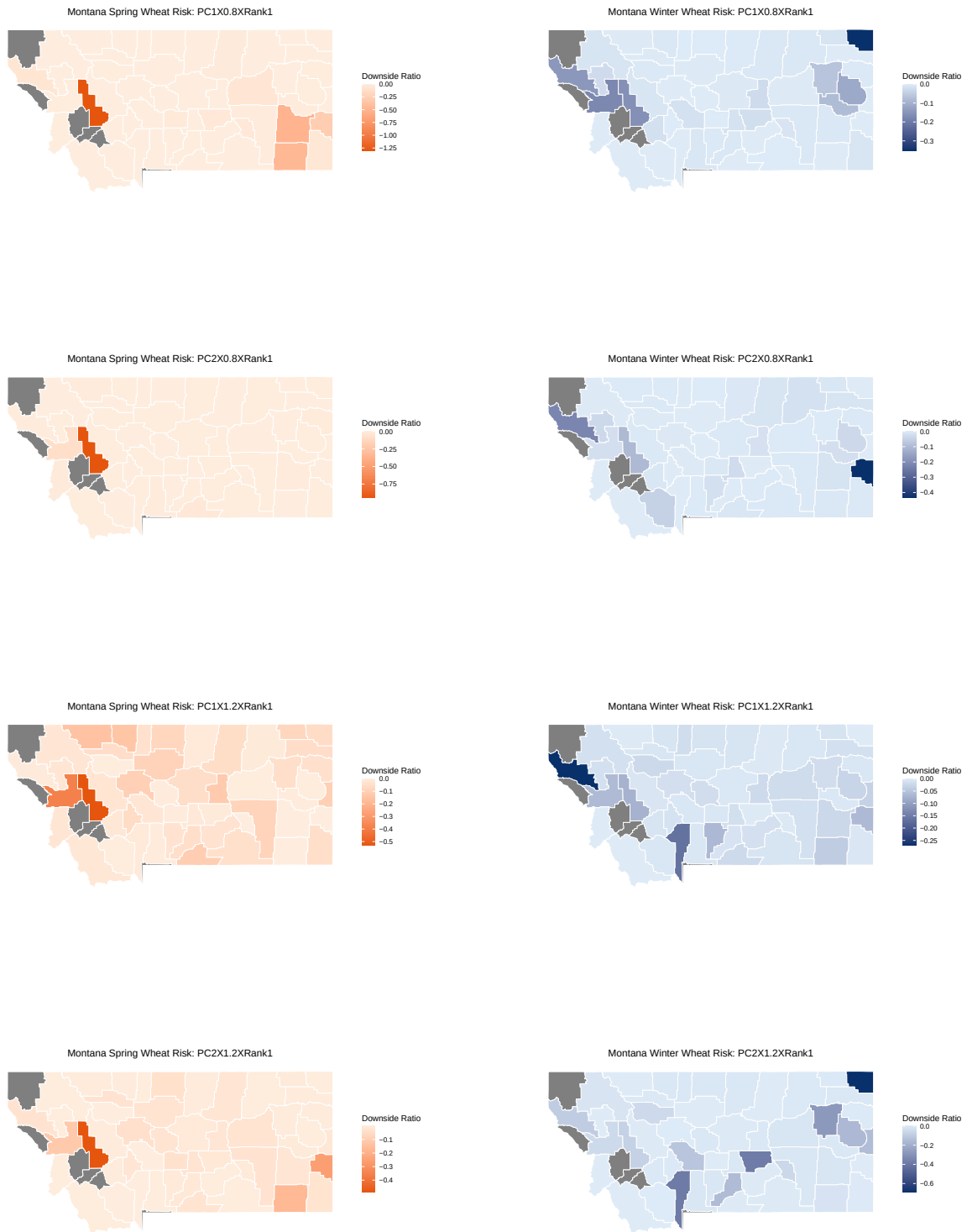


Figure 24: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 1$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

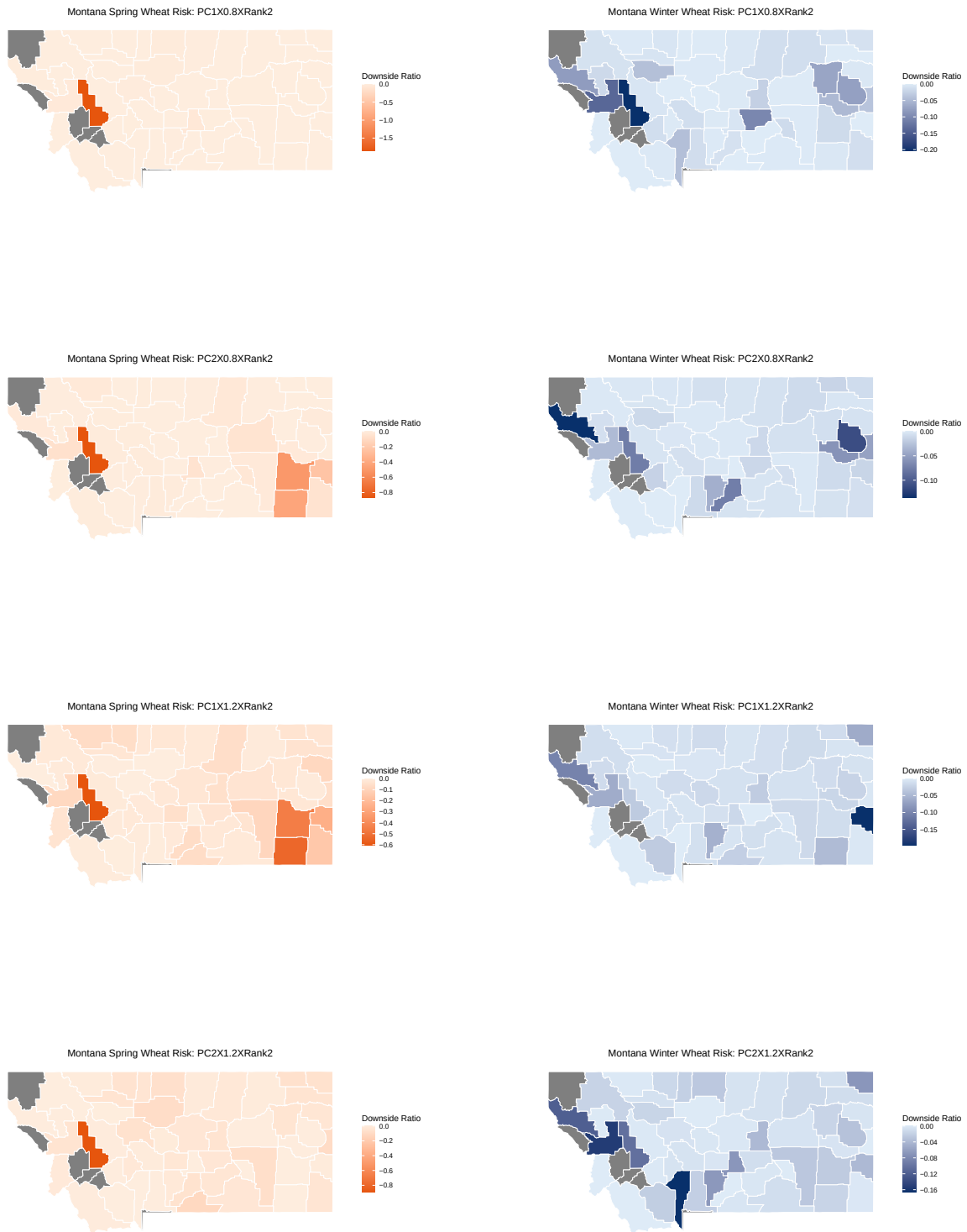


Figure 25: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 2$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

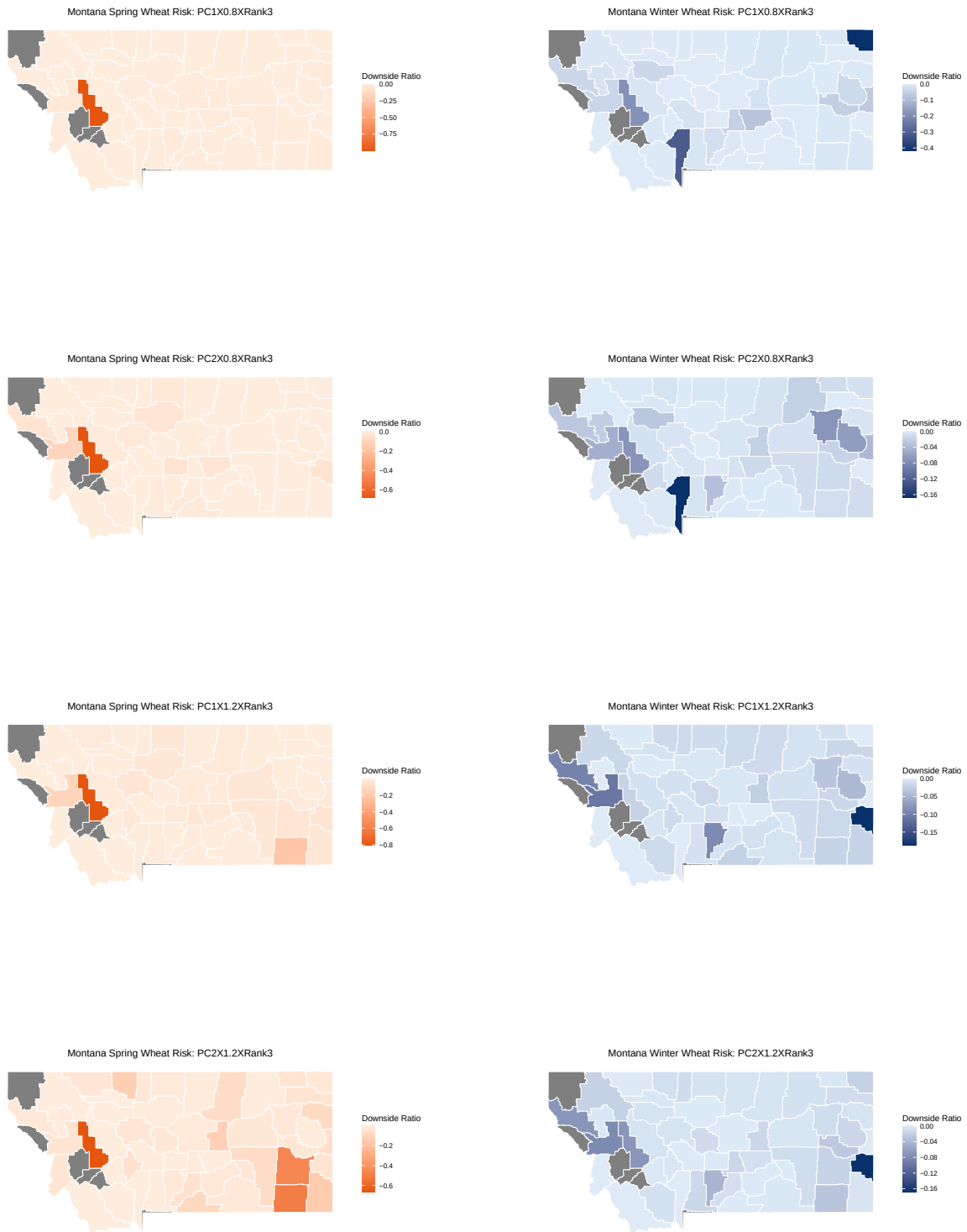


Figure 26: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 3$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

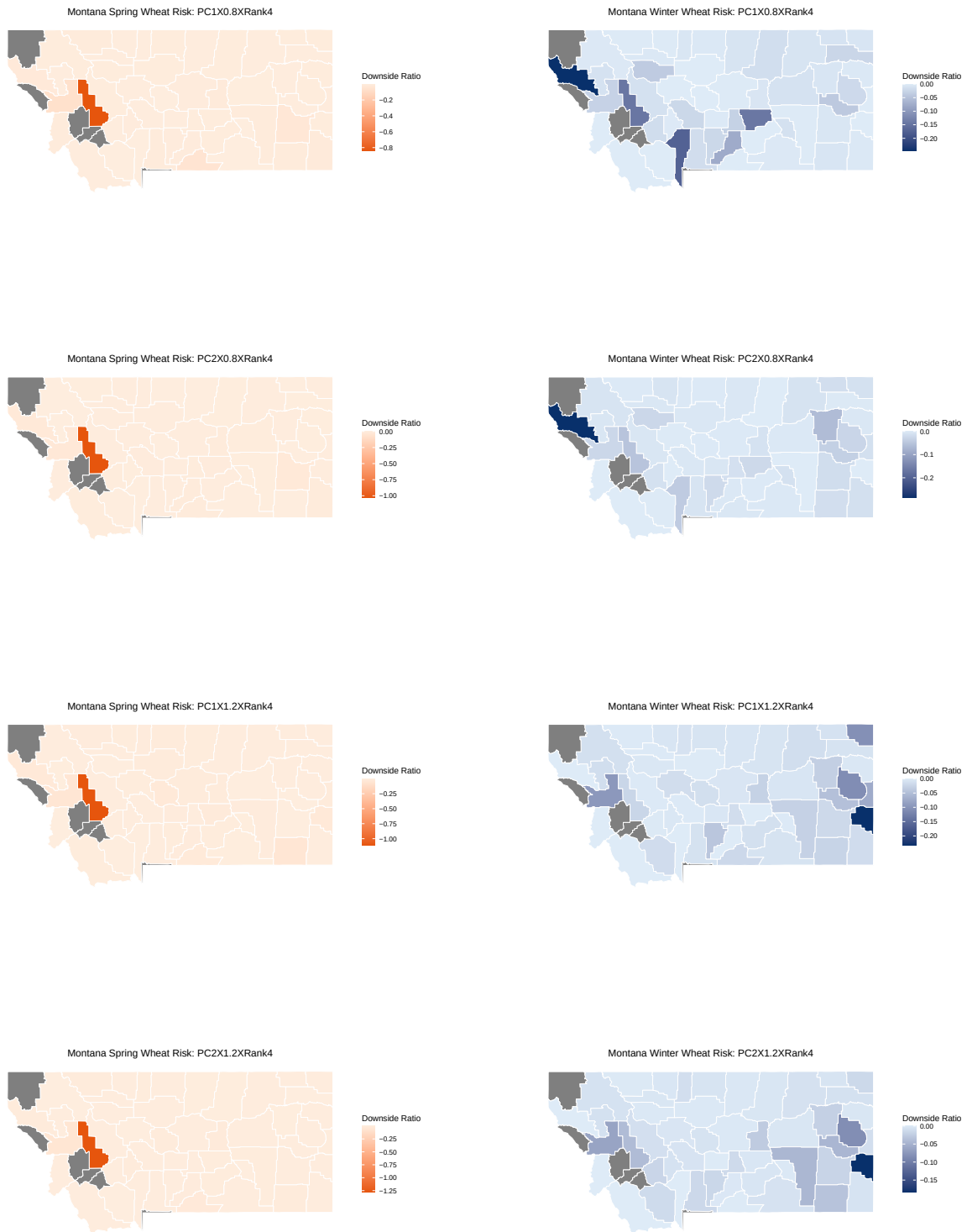


Figure 27: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 4$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

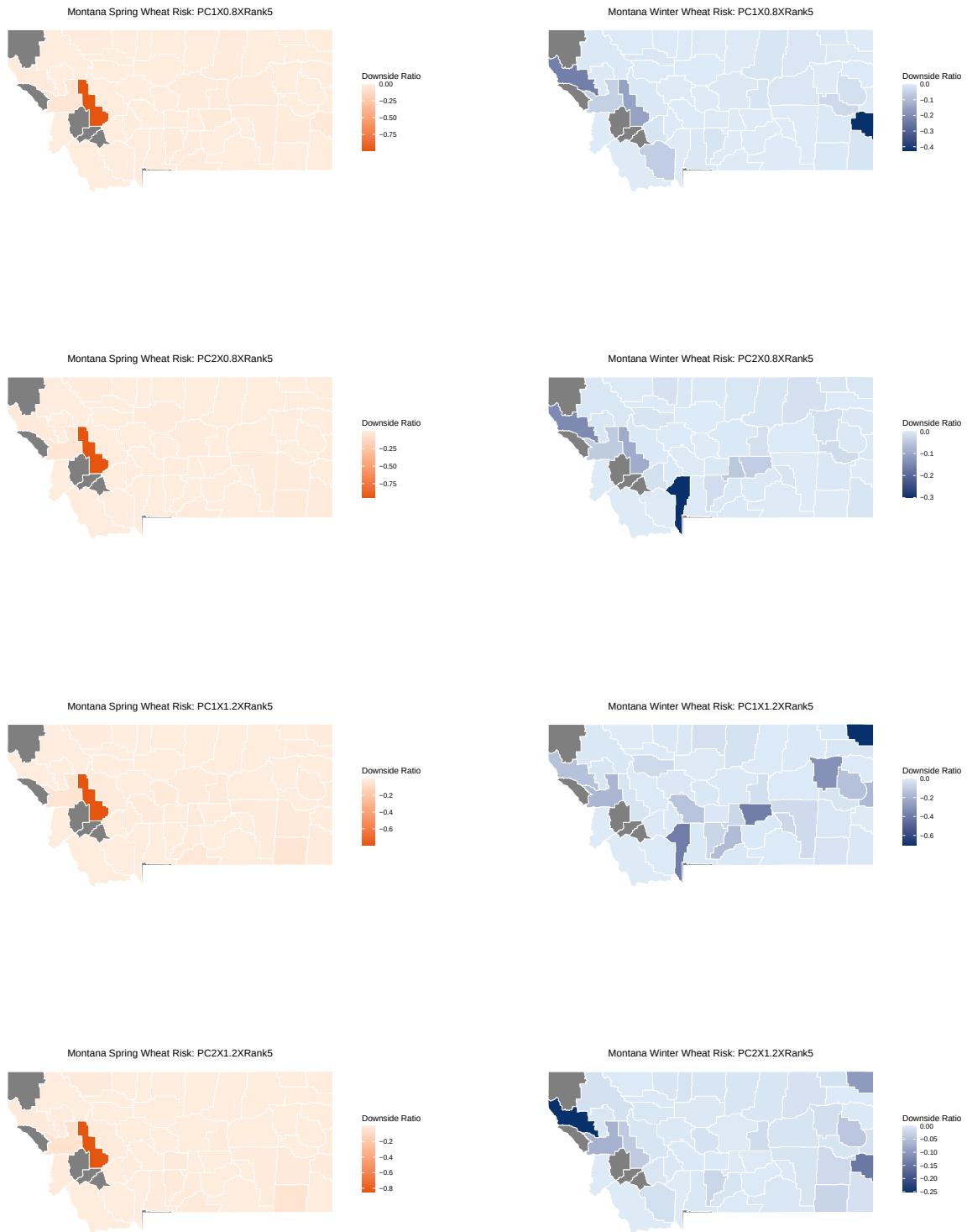


Figure 28: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 5$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

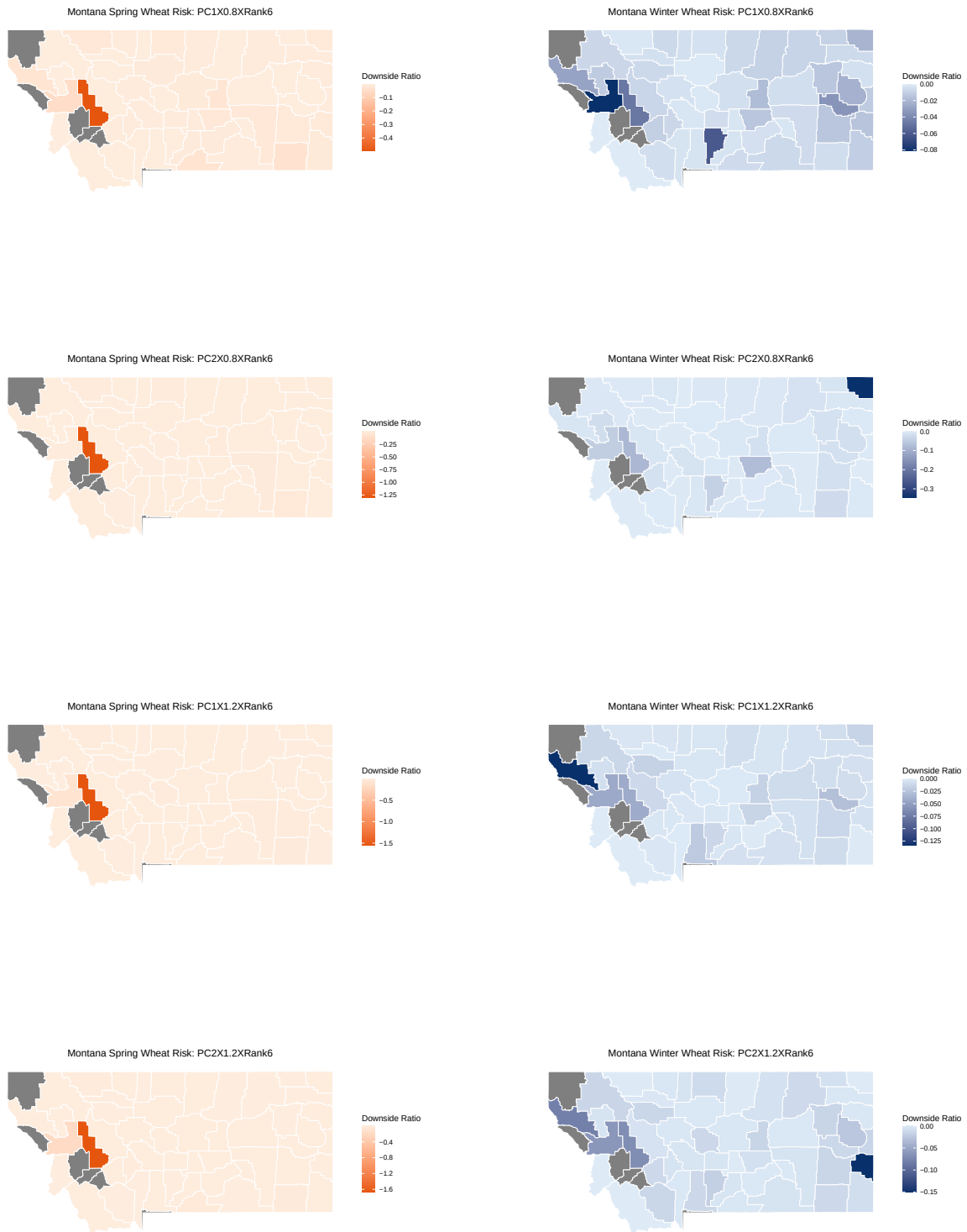


Figure 29: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 6$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

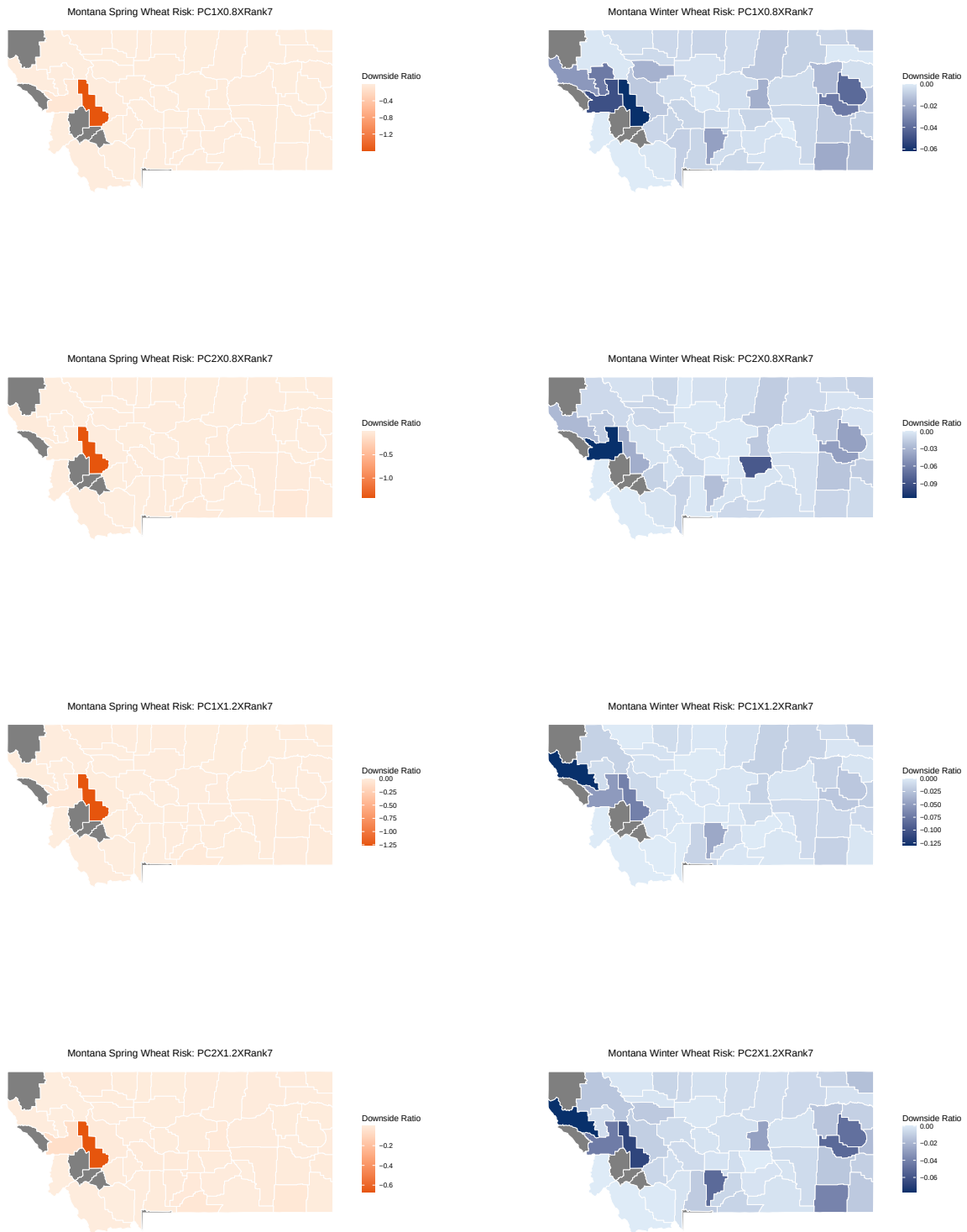


Figure 30: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 7$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

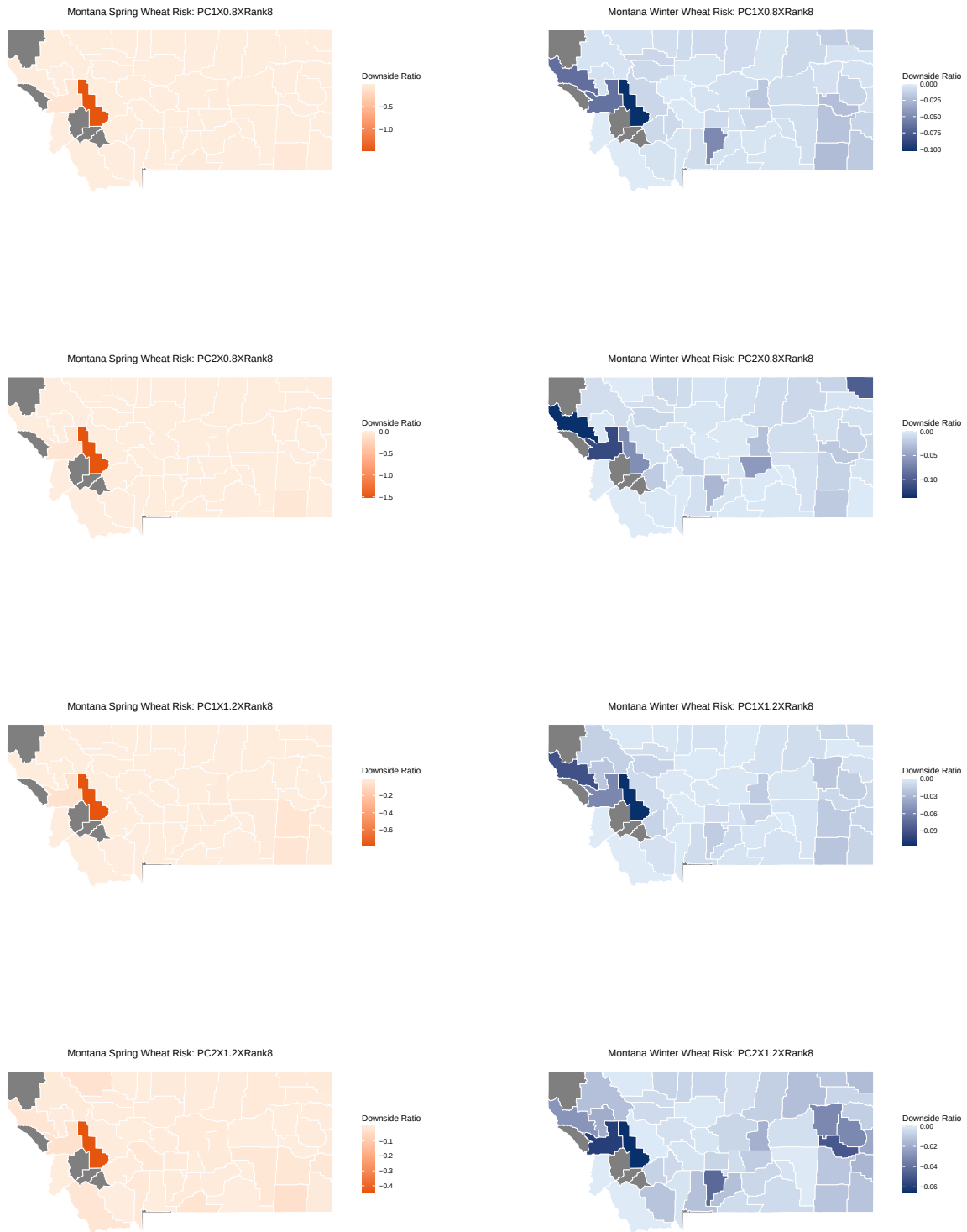


Figure 31: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 8$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

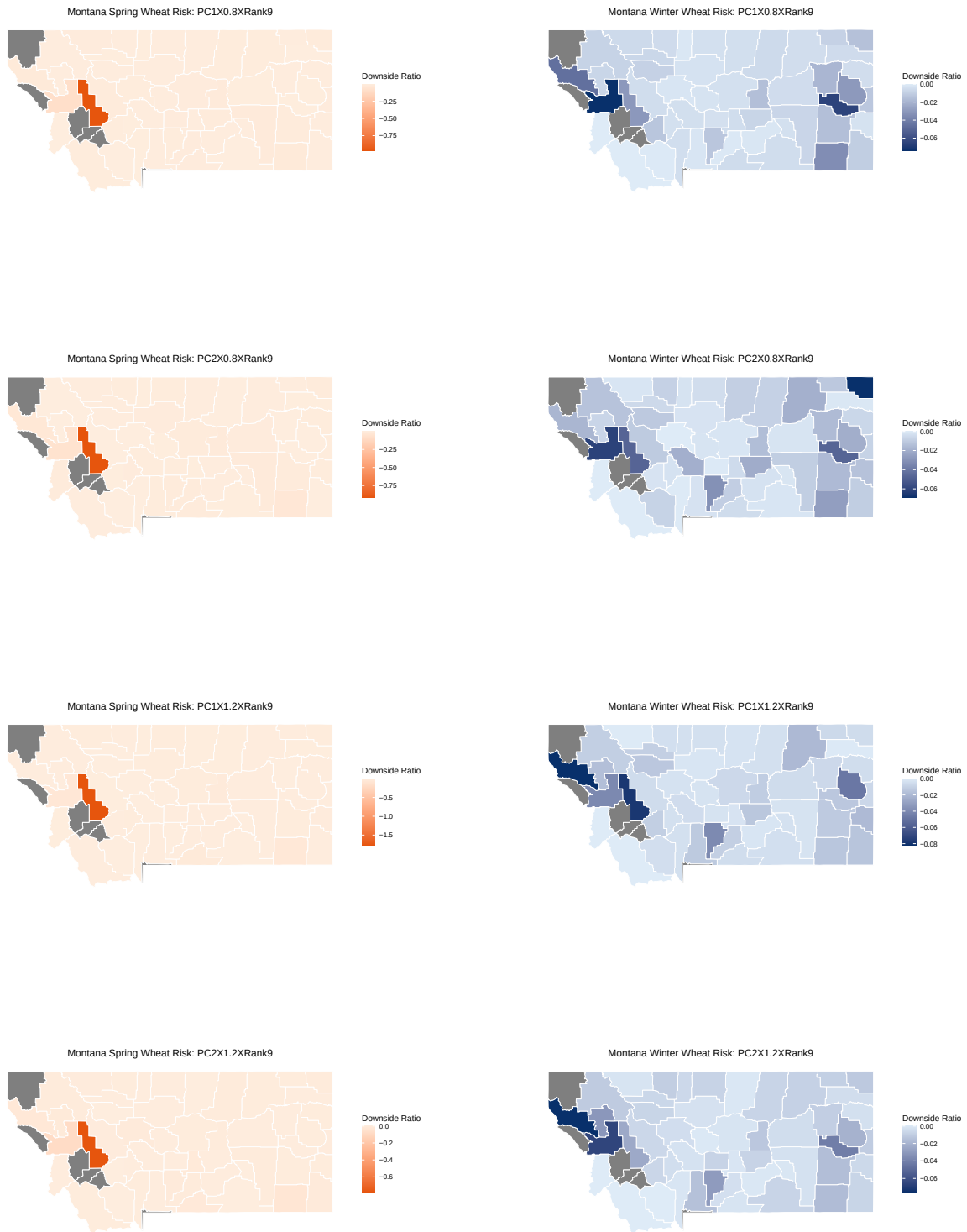


Figure 32: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 9$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.

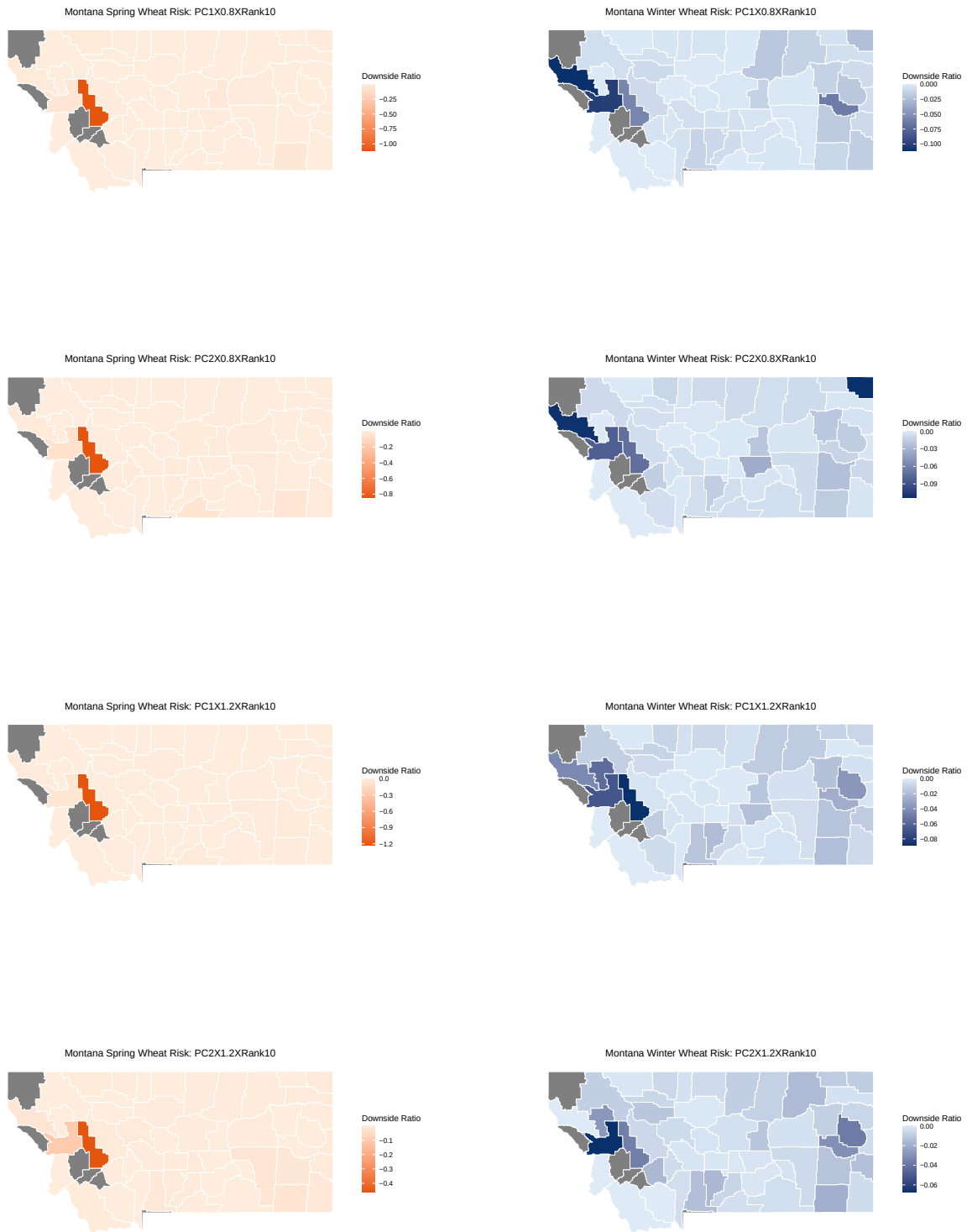


Figure 33: Montana County Spring/Winter Wheat Risk Maps (Top-loading-variable $\pm 50\%$, $Rank = 10$)

Note: The darker colors represent greater risk and the grey areas were not included in the empirical analysis.