**GLDAS Variables**

ACond\_tavg Aerodynamic conductance Geo2D

Albedo\_inst Albedo Geo2D

AvgSurfT\_inst Average Surface Skin temperature Geo2D

CanopInt\_inst Plant canopy surface water Geo2D

ECanop\_tavg Canopy water evaporation Geo2D

ESoil\_tavg Direct Evaporation from Bare Soil Geo2D

Evap\_tavg Evapotranspiration Geo2D

LWdown\_f\_tavg Downward long-wave radiation flux Geo2D

Lwnet\_tavg Net long-wave radiation flux Geo2D

Psurf\_f\_inst Pressure Geo2D

Qair\_f\_inst Specific humidity Geo2D

Qg\_tavg Heat flux Geo2D

Qh\_tavg Sensible heat net flux Geo2D

Qle\_tavg Latent heat net flux Geo2D

Qs\_acc Storm surface runoff Geo2D

Qsb\_acc Baseflow-groundwater runoff Geo2D

Qsm\_acc Snow melt Geo2D

Rainf\_f\_tavg Total precipi tation rate Geo2D

Rainf\_tavg Rain precipitation rate Geo2D

SnowDepth\_inst Snow depth Geo2D

Snowf\_tavg Snow precipitation rate Geo2D

SnowT\_tavg Snow Surface temperature Geo2D

SoilMoist\_P\_inst Profile Soil moisture Geo2D

SoilMoist\_RZ\_inst Root Zone Soil moisture Geo2D

SoilMoist\_S\_inst Surface Soil moisture Geo2D

SoilTMP0\_10cm\_inst Soil temperature Geo2D

SoilTMP10\_29cm\_inst Soil temperature Geo2D

SoilTMP144\_295cm\_inst Soil temperature Geo2D

SoilTMP295\_1295cm\_inst Soil temperature Geo2D

SoilTMP29\_68cm\_inst Soil temperature Geo2D

SoilTMP68\_144cm\_inst Soil temperature Geo2D

SWdown\_f\_tavg Downward short-wave radiation flux Geo2D

SWE\_inst Snow depth water equivalent Geo2D

Swnet\_tavg Net short wave radiation flux Geo2D

Tair\_f\_inst Temperature Geo2D

TVeg\_tavg Transpiration Geo2D

TWS\_inst Terrestrial water storage Geo2D

Wind\_f\_inst Wind speed Geo2D

R version 4.3.1 (2023-06-16) -- "Beagle Scouts"

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Platform: x86\_64-apple-darwin20 (64-bit)

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[R.app GUI 1.79 (8238) x86\_64-apple-darwin20]

[History restored from /Users/gaellemuller-greven/.Rapp.history]

> wheat\_nasa\_lm\_output <- read.csv("/Users/gaellemuller-greven/Dropbox/data\_science/projects/nasa\_space\_apps\_2025/non\_raw\_data\_docs/data/combined\_nasa\_wheat\_df\_mandan\_nd\_all\_perennial\_trt.csv", head = TRUE)

> library(tidyr)

> library(dplyr)

Attaching package: ‘dplyr’

The following objects are masked from ‘package:stats’:

filter, lag

The following objects are masked from ‘package:base’:

intersect, setdiff, setequal, union

> library(ncdf4)

> library(ggplot2)

>

>

> wheat\_nasa\_lm\_output <- read.csv("/Users/gaellemuller-greven/Dropbox/data\_science/projects/nasa\_space\_apps\_2025/non\_raw\_data\_docs/data/combined\_nasa\_wheat\_df\_mandan\_nd\_all\_perennial\_trt.csv", head = TRUE)

> str(wheat\_nasa\_lm\_output)

'data.frame': 4928 obs. of 7 variables:

$ wheat\_variable: chr "mean\_s" "mean\_mn" "mean\_mn" "mean\_protein" ...

$ variable : chr "mean\_SoilTMP295\_1295cm\_inst" "mean\_ESoil\_tavg" "mean\_Qle\_tavg" "mean\_SoilTMP295\_1295cm\_inst" ...

$ estimate : num 1.37 3.47e-01 3.34e-01 1.65e+02 9.08e+05 ...

$ p\_value : num 0.00151 0.00152 0.00167 0.01178 0.013 ...

$ r\_squared : num 0.997 0.997 0.997 0.977 0.974 ...

$ season : chr "preseason" "preseason" "preseason" "preseason" ...

$ perennial\_trt : chr "AFW" "AFW" "AFW" "AFW" ...

>

> wheat\_nasa\_lm\_output\_significant <- wheat\_nasa\_lm\_output %>% filter(p\_value < 0.05)

> str(wheat\_nasa\_lm\_output\_significant)

'data.frame': 158 obs. of 7 variables:

$ wheat\_variable: chr "mean\_s" "mean\_mn" "mean\_mn" "mean\_protein" ...

$ variable : chr "mean\_SoilTMP295\_1295cm\_inst" "mean\_ESoil\_tavg" "mean\_Qle\_tavg" "mean\_SoilTMP295\_1295cm\_inst" ...

$ estimate : num 1.37 3.47e-01 3.34e-01 1.65e+02 9.08e+05 ...

$ p\_value : num 0.00151 0.00152 0.00167 0.01178 0.013 ...

$ r\_squared : num 0.997 0.997 0.997 0.977 0.974 ...

$ season : chr "preseason" "preseason" "preseason" "preseason" ...

$ perennial\_trt : chr "AFW" "AFW" "AFW" "AFW" ...

> as.data.frame(wheat\_nasa\_lm\_output\_significant)

wheat\_variable variable estimate p\_value r\_squared season perennial\_trt

1 mean\_s mean\_SoilTMP295\_1295cm\_inst 1.370195e+00 0.001505830 0.9969906 preseason AFW

2 mean\_mn mean\_ESoil\_tavg 3.465032e-01 0.001519817 0.9969627 preseason AFW

3 mean\_mn mean\_Qle\_tavg 3.344358e-01 0.001667980 0.9966668 preseason AFW

4 mean\_protein mean\_SoilTMP295\_1295cm\_inst 1.646958e+02 0.011784913 0.9765691 preseason AFW

5 mean\_mn mean\_Evap\_tavg 9.080597e+05 0.013004107 0.9741609 preseason AFW

6 mean\_ni mean\_SoilMoist\_P\_inst -1.275794e-03 0.014737456 0.9707423 preseason AFW

7 mean\_p mean\_Lwnet\_tavg 8.506795e-02 0.017830312 0.9646573 preseason AFW

8 mean\_ni mean\_TWS\_inst -1.155244e-03 0.020312375 0.9597878 preseason AFW

9 mean\_mn mean\_TVeg\_tavg 2.673672e+01 0.030520543 0.9398904 preseason AFW

10 mean\_ni mean\_SoilMoist\_RZ\_inst -8.425353e-03 0.030696331 0.9395496 preseason AFW

11 mean\_p mean\_ECanop\_tavg -1.927042e+00 0.032995320 0.9350981 preseason AFW

12 mean\_k mean\_Evap\_tavg -6.903231e+04 0.042244900 0.9172948 preseason AFW

13 mean\_ni mean\_SoilMoist\_S\_inst -4.061152e-01 0.042733423 0.9163593 preseason AFW

14 mean\_p mean\_Wind\_f\_inst -1.231659e+00 0.043914075 0.9141003 preseason AFW

15 mean\_tkw mean\_Wind\_f\_inst 6.684276e+00 0.044839293 0.9123320 preseason AFW

16 mean\_ca mean\_SWdown\_f\_tavg 1.554833e-03 0.046781547 0.9086254 preseason AFW

17 mean\_tkw mean\_ACond\_tavg 1.770981e+03 0.048932266 0.9045298 preseason AFW

18 mean\_fe mean\_AvgSurfT\_inst 4.045104e+00 0.002988450 0.9940320 season AFW

19 mean\_fe mean\_Tair\_f\_inst 4.724872e+00 0.004548441 0.9909238 season AFW

20 mean\_fe mean\_SnowT\_tavg 4.032300e+00 0.005610282 0.9888109 season AFW

21 mean\_fe mean\_Qs\_acc -4.771566e+02 0.005905926 0.9882230 season AFW

22 mean\_fe mean\_CanopInt\_inst -8.902079e+02 0.016410863 0.9674476 season AFW

23 mean\_fe mean\_SoilTMP0\_10cm\_inst 3.422904e+00 0.017552309 0.9652035 season AFW

24 mean\_ca mean\_Psurf\_f\_inst 1.508350e-04 0.022006109 0.9564721 season AFW

25 mean\_fe mean\_Qh\_tavg 7.565463e-01 0.025316830 0.9500073 season AFW

26 mean\_ni mean\_SWdown\_f\_tavg 4.097787e-02 0.031373395 0.9382375 season AFW

27 mean\_ni mean\_Swnet\_tavg 4.960859e-02 0.031814493 0.9373832 season AFW

28 mean\_fe mean\_Rainf\_tavg -5.221556e+05 0.042423992 0.9169518 season AFW

29 mean\_fe mean\_Rainf\_f\_tavg -5.218163e+05 0.042821442 0.9161908 season AFW

30 mean\_fe mean\_SoilTMP10\_29cm\_inst 2.563903e+00 0.044570908 0.9128447 season AFW

31 mean\_fe mean\_Wind\_f\_inst -1.435790e+01 0.003442700 0.9931265 postseason AFW

32 mean\_mn mean\_SoilMoist\_S\_inst -1.128040e+01 0.004583834 0.9908533 postseason AFW

33 mean\_mg mean\_Snowf\_tavg 6.816151e+04 0.005435541 0.9891585 postseason AFW

34 mean\_mn mean\_SoilMoist\_RZ\_inst -2.420630e-01 0.005596073 0.9888392 postseason AFW

35 mean\_mg mean\_Qsm\_acc 1.247095e+01 0.015513715 0.9692132 postseason AFW

36 mean\_ni mean\_Albedo\_inst 6.197894e-02 0.029482400 0.9419044 postseason AFW

37 mean\_mg mean\_SnowDepth\_inst 1.053154e+01 0.044262585 0.9134340 postseason AFW

38 mean\_mg mean\_SWE\_inst 7.020982e-02 0.044262722 0.9134337 postseason AFW

39 mean\_ca mean\_Qs\_acc -2.001661e+00 0.018151426 0.9640266 preseason Alfalfa

40 mean\_protein mean\_Wind\_f\_inst -5.182874e+01 0.026944904 0.9468362 preseason Alfalfa

41 mean\_s mean\_SoilTMP295\_1295cm\_inst 1.360382e+00 0.036343022 0.9286348 preseason Alfalfa

42 mean\_p mean\_SoilTMP295\_1295cm\_inst 4.252605e+00 0.037861573 0.9257104 preseason Alfalfa

43 mean\_k mean\_SoilTMP295\_1295cm\_inst 2.296770e+00 0.040355207 0.9209181 preseason Alfalfa

44 mean\_ni mean\_SoilMoist\_P\_inst -1.322496e-03 0.044936656 0.9121460 preseason Alfalfa

45 mean\_ca mean\_ESoil\_tavg -3.456968e-03 0.000520570 0.9989591 season Alfalfa

46 mean\_ca mean\_Qle\_tavg -2.269913e-03 0.001454554 0.9970930 season Alfalfa

47 mean\_ca mean\_Evap\_tavg -5.598919e+03 0.001455615 0.9970909 season Alfalfa

48 mean\_ca mean\_TWS\_inst -1.317490e-04 0.007719072 0.9846214 season Alfalfa

49 mean\_ca mean\_SoilMoist\_P\_inst -1.317530e-04 0.007722500 0.9846146 season Alfalfa

50 mean\_ca mean\_SoilMoist\_RZ\_inst -8.780300e-04 0.009356223 0.9813751 season Alfalfa

51 mean\_ca mean\_TVeg\_tavg -9.373124e-03 0.009864673 0.9803680 season Alfalfa

52 mean\_mn mean\_SoilTMP295\_1295cm\_inst 1.976573e+01 0.012024628 0.9760953 season Alfalfa

53 mean\_ca mean\_SoilMoist\_S\_inst -4.122806e-02 0.017076874 0.9661379 season Alfalfa

54 mean\_ni mean\_Snowf\_tavg 1.169686e+07 0.019575517 0.9612322 season Alfalfa

55 mean\_ni mean\_SnowDepth\_inst 1.146573e+05 0.019575517 0.9612322 season Alfalfa

56 mean\_ni mean\_SWE\_inst 7.643809e+02 0.019575517 0.9612322 season Alfalfa

57 mean\_ni mean\_Qsm\_acc 1.355444e+04 0.019575517 0.9612322 season Alfalfa

58 mean\_ca mean\_Lwnet\_tavg -2.926572e-03 0.027944691 0.9448915 season Alfalfa

59 mean\_fe mean\_ECanop\_tavg -6.132791e+00 0.030772345 0.9394022 season Alfalfa

60 mean\_ni mean\_Albedo\_inst 6.818169e-02 0.001625649 0.9967513 postseason Alfalfa

61 mean\_mn mean\_SWdown\_f\_tavg -1.391496e-01 0.006842119 0.9863626 postseason Alfalfa

62 mean\_fe mean\_ESoil\_tavg -3.907884e-01 0.011022267 0.9780770 postseason Alfalfa

63 mean\_mn mean\_SoilTMP295\_1295cm\_inst 1.079915e+01 0.011101433 0.9779204 postseason Alfalfa

64 mean\_mn mean\_TVeg\_tavg -6.164607e+00 0.011777727 0.9765833 postseason Alfalfa

65 mean\_mn mean\_Swnet\_tavg -1.619069e-01 0.012073892 0.9759980 postseason Alfalfa

66 mean\_mn mean\_Qle\_tavg -2.551077e-01 0.015057950 0.9701108 postseason Alfalfa

67 mean\_mn mean\_Evap\_tavg -6.413751e+05 0.015678368 0.9688891 postseason Alfalfa

68 mean\_mn mean\_Qair\_f\_inst -3.351621e+03 0.018237974 0.9638567 postseason Alfalfa

69 mean\_fe mean\_Qle\_tavg -3.650769e-01 0.018691907 0.9629656 postseason Alfalfa

70 mean\_fe mean\_TVeg\_tavg -8.779843e+00 0.020126588 0.9601519 postseason Alfalfa

71 mean\_mn mean\_ESoil\_tavg -2.694721e-01 0.020454154 0.9595101 postseason Alfalfa

72 mean\_fe mean\_Evap\_tavg -9.152965e+05 0.022040701 0.9564044 postseason Alfalfa

73 mean\_ni mean\_CanopInt\_inst 5.418162e+01 0.023867380 0.9528349 postseason Alfalfa

74 mean\_s mean\_Psurf\_f\_inst 5.368671e-03 0.024336079 0.9519201 postseason Alfalfa

75 mean\_mn mean\_ACond\_tavg -1.937470e+03 0.025256663 0.9501246 postseason Alfalfa

76 mean\_fe mean\_Lwnet\_tavg 8.929793e-01 0.029470104 0.9419283 postseason Alfalfa

77 mean\_ni mean\_SWE\_inst 7.891817e-02 0.030378996 0.9401649 postseason Alfalfa

78 mean\_ni mean\_SnowDepth\_inst 1.183779e+01 0.030379194 0.9401645 postseason Alfalfa

79 mean\_mn mean\_SoilTMP0\_10cm\_inst -7.904861e-01 0.030557994 0.9398178 postseason Alfalfa

80 mean\_mg mean\_Snowf\_tavg 7.340922e+04 0.031073470 0.9388186 postseason Alfalfa

81 mean\_mn mean\_SoilTMP10\_29cm\_inst -8.993928e-01 0.031836850 0.9373399 postseason Alfalfa

82 mean\_ni mean\_Rainf\_f\_tavg 1.462189e+04 0.033602996 0.9339232 postseason Alfalfa

83 mean\_mg mean\_Qg\_tavg -2.538459e-02 0.034855532 0.9315038 postseason Alfalfa

84 mean\_mn mean\_Tair\_f\_inst -6.877892e-01 0.035976076 0.9293421 postseason Alfalfa

85 mean\_mn mean\_LWdown\_f\_tavg -1.890049e-01 0.036436155 0.9284553 postseason Alfalfa

86 mean\_fe mean\_Qg\_tavg -1.000503e+00 0.036541723 0.9282519 postseason Alfalfa

87 mean\_k mean\_Qsm\_acc 3.305452e+01 0.037761527 0.9259029 postseason Alfalfa

88 mean\_mn mean\_SnowT\_tavg -7.043798e-01 0.040617475 0.9204148 postseason Alfalfa

89 mean\_mn mean\_AvgSurfT\_inst -7.019894e-01 0.041629411 0.9184742 postseason Alfalfa

90 mean\_ni mean\_Qs\_acc 1.364406e+01 0.046099808 0.9099256 postseason Alfalfa

91 mean\_mn mean\_SoilTMP29\_68cm\_inst -1.192253e+00 0.046702059 0.9087770 postseason Alfalfa

92 mean\_ni mean\_Rainf\_tavg 1.748165e+04 0.047580908 0.9071021 postseason Alfalfa

93 mean\_fe mean\_SoilTMP29\_68cm\_inst 1.140851e+00 0.008871097 0.9823365 preseason IWG

94 mean\_fe mean\_LWdown\_f\_tavg 2.117665e-01 0.011588195 0.9769579 preseason IWG

95 mean\_fe mean\_SoilTMP10\_29cm\_inst 9.776396e-01 0.021688557 0.9570933 preseason IWG

96 mean\_fe mean\_SoilTMP0\_10cm\_inst 8.958223e-01 0.029382041 0.9420992 preseason IWG

97 mean\_fe mean\_Qair\_f\_inst 6.431614e+03 0.029424902 0.9420160 preseason IWG

98 mean\_fe mean\_SoilTMP68\_144cm\_inst 2.146569e+00 0.035673394 0.9299258 preseason IWG

99 mean\_fe mean\_SoilTMP144\_295cm\_inst 3.730898e+00 0.036018683 0.9292600 preseason IWG

100 mean\_tkw mean\_SoilTMP295\_1295cm\_inst -2.302199e+01 0.045931272 0.9102471 preseason IWG

101 mean\_mg mean\_SoilTMP295\_1295cm\_inst 7.463142e-01 0.047382641 0.9074798 preseason IWG

102 mean\_fe mean\_SoilTMP68\_144cm\_inst 9.649050e-01 0.002397996 0.9952098 season IWG

103 mean\_fe mean\_SoilTMP144\_295cm\_inst 1.225644e+00 0.004352590 0.9913138 season IWG

104 mean\_ca mean\_Qair\_f\_inst -3.124535e+01 0.005100651 0.9898247 season IWG

105 mean\_fe mean\_SoilTMP10\_29cm\_inst 1.987981e+00 0.007090667 0.9858689 season IWG

106 mean\_fe mean\_SoilTMP0\_10cm\_inst 2.574662e+00 0.009543645 0.9810038 season IWG

107 mean\_fe mean\_SoilTMP29\_68cm\_inst 1.368156e+00 0.013423245 0.9733337 season IWG

108 mean\_fe mean\_SnowT\_tavg 2.967428e+00 0.019191218 0.9619859 season IWG

109 mean\_ca mean\_LWdown\_f\_tavg -3.840872e-03 0.020425216 0.9595668 season IWG

110 mean\_fe mean\_Qs\_acc -3.501845e+02 0.022168728 0.9561540 season IWG

111 mean\_fe mean\_AvgSurfT\_inst 2.949872e+00 0.025517379 0.9496164 season IWG

112 mean\_fe mean\_Tair\_f\_inst 3.440828e+00 0.028386694 0.9440324 season IWG

113 mean\_fe mean\_Rainf\_tavg -3.913240e+05 0.038143636 0.9251677 season IWG

114 mean\_fe mean\_Rainf\_f\_tavg -3.911973e+05 0.038229388 0.9250027 season IWG

115 mean\_mn mean\_Qair\_f\_inst 3.785890e+03 0.041573595 0.9185812 season IWG

116 mean\_mn mean\_Psurf\_f\_inst -2.179552e-02 0.048314198 0.9057059 season IWG

117 mean\_fe mean\_SoilTMP144\_295cm\_inst 4.088736e+00 0.012581436 0.9749954 postseason IWG

118 mean\_fe mean\_Wind\_f\_inst -1.049001e+01 0.024139621 0.9523035 postseason IWG

119 mean\_mg mean\_Qsm\_acc 1.090022e+01 0.030627419 0.9396832 postseason IWG

120 mean\_mn mean\_SoilTMP144\_295cm\_inst 2.117781e+00 0.002016329 0.9959714 preseason MIX

121 mean\_s mean\_SoilTMP295\_1295cm\_inst 1.105927e+00 0.005000368 0.9900243 preseason MIX

122 mean\_protein mean\_Wind\_f\_inst -4.526204e+01 0.011627787 0.9768796 preseason MIX

123 mean\_ni mean\_Qh\_tavg 1.378985e-02 0.024003355 0.9525695 preseason MIX

124 mean\_mn mean\_LWdown\_f\_tavg 1.139551e-01 0.029933356 0.9410293 preseason MIX

125 mean\_ca mean\_TWS\_inst -1.521480e-04 0.044714674 0.9125701 preseason MIX

126 mean\_mn mean\_Qair\_f\_inst 3.464240e+03 0.046536113 0.9090934 preseason MIX

127 mean\_mn mean\_SoilTMP29\_68cm\_inst 6.009729e-01 0.047767414 0.9067469 preseason MIX

128 mean\_ca mean\_Psurf\_f\_inst 1.340140e-04 0.002784910 0.9944379 season MIX

129 mean\_ni mean\_Qsm\_acc 1.451580e+04 0.009873950 0.9803496 season MIX

130 mean\_ni mean\_SWE\_inst 8.185957e+02 0.009873950 0.9803496 season MIX

131 mean\_ni mean\_Snowf\_tavg 1.252647e+07 0.009873950 0.9803496 season MIX

132 mean\_ni mean\_SnowDepth\_inst 1.227895e+05 0.009873950 0.9803496 season MIX

133 mean\_fe mean\_AvgSurfT\_inst 3.599596e+00 0.019762558 0.9608654 season MIX

134 mean\_mn mean\_SoilTMP68\_144cm\_inst 5.181793e-01 0.022897938 0.9547284 season MIX

135 mean\_fe mean\_SnowT\_tavg 3.581441e+00 0.024182649 0.9522195 season MIX

136 mean\_fe mean\_Tair\_f\_inst 4.190531e+00 0.024547516 0.9515075 season MIX

137 mean\_fe mean\_CanopInt\_inst -7.990261e+02 0.024583231 0.9514379 season MIX

138 mean\_fe mean\_Qs\_acc -4.230390e+02 0.026235517 0.9482173 season MIX

139 mean\_fe mean\_Qh\_tavg 6.783647e-01 0.034397994 0.9323872 season MIX

140 mean\_fe mean\_SoilTMP0\_10cm\_inst 3.019192e+00 0.042558069 0.9166951 season MIX

141 mean\_mn mean\_SoilTMP144\_295cm\_inst 6.453242e-01 0.043893764 0.9141391 season MIX

142 mean\_ni mean\_Rainf\_tavg 1.946181e+04 0.000125285 0.9997494 postseason MIX

143 mean\_ni mean\_Qs\_acc 1.514615e+01 0.001430109 0.9971418 postseason MIX

144 mean\_mg mean\_Snowf\_tavg 5.313634e+04 0.001544743 0.9969129 postseason MIX

145 mean\_ni mean\_Rainf\_f\_tavg 1.598263e+04 0.003868265 0.9922784 postseason MIX

146 mean\_fe mean\_Wind\_f\_inst -1.293518e+01 0.008047447 0.9839699 postseason MIX

147 mean\_mg mean\_SnowDepth\_inst 8.463767e+00 0.010868970 0.9783802 postseason MIX

148 mean\_mg mean\_SWE\_inst 5.642478e-02 0.010869055 0.9783800 postseason MIX

149 mean\_ni mean\_CanopInt\_inst 5.815987e+01 0.011908872 0.9763241 postseason MIX

150 mean\_mg mean\_Qsm\_acc 9.636625e+00 0.020333484 0.9597465 postseason MIX

151 mean\_mn mean\_Qair\_f\_inst -1.535474e+03 0.031223770 0.9385274 postseason MIX

152 mean\_s mean\_Psurf\_f\_inst 4.186800e-03 0.033614053 0.9339018 postseason MIX

153 mean\_fe mean\_Evap\_tavg -6.447312e+05 0.036719333 0.9279096 postseason MIX

154 mean\_fe mean\_Qle\_tavg -2.552592e-01 0.040560218 0.9205247 postseason MIX

155 mean\_mn mean\_SoilTMP295\_1295cm\_inst 4.863017e+00 0.040825028 0.9200166 postseason MIX

156 mean\_fe mean\_ESoil\_tavg -2.707377e-01 0.041904567 0.9179469 postseason MIX

157 mean\_ni mean\_Albedo\_inst 6.916198e-02 0.044985819 0.9120521 postseason MIX

158 mean\_fe mean\_TVeg\_tavg -6.098232e+00 0.048295029 0.9057424 postseason MIX

>

>

>

> wheat\_nasa\_lm\_output\_significant\_summary <- wheat\_nasa\_lm\_output\_significant %>% group\_by(wheat\_variable) %>% summarize(count = n()) %>% arrange(desc(count))

>

> as.data.frame(wheat\_nasa\_lm\_output\_significant\_summary)

wheat\_variable count

1 mean\_fe 50

2 mean\_mn 33

3 mean\_ni 29

4 mean\_ca 16

5 mean\_mg 12

6 mean\_s 5

7 mean\_p 4

8 mean\_k 3

9 mean\_protein 3

10 mean\_tkw 3

>

> wheat\_nasa\_lm\_output\_significant\_summary\_season <- wheat\_nasa\_lm\_output\_significant %>% group\_by(wheat\_variable, season) %>% summarize(count = n()) %>% arrange(desc(count))

`summarise()` has grouped output by 'wheat\_variable'. You can override using the `.groups` argument.

>

> as.data.frame(wheat\_nasa\_lm\_output\_significant\_summary\_season)

wheat\_variable season count

1 mean\_fe season 29

2 mean\_mn postseason 20

3 mean\_fe postseason 14

4 mean\_ca season 13

5 mean\_ni postseason 13

6 mean\_mg postseason 11

7 mean\_ni season 10

8 mean\_mn preseason 8

9 mean\_fe preseason 7

10 mean\_ni preseason 6

11 mean\_mn season 5

12 mean\_p preseason 4

13 mean\_ca preseason 3

14 mean\_protein preseason 3

15 mean\_s preseason 3

16 mean\_tkw preseason 3

17 mean\_k preseason 2

18 mean\_s postseason 2

19 mean\_k postseason 1

20 mean\_mg preseason 1

>

>

> wheat\_nasa\_lm\_output\_significant\_summary\_nasa <- wheat\_nasa\_lm\_output\_significant %>% group\_by(wheat\_variable, variable) %>% summarize(count = n()) %>% arrange(desc(count))

`summarise()` has grouped output by 'wheat\_variable'. You can override using the `.groups` argument.

> as.data.frame(wheat\_nasa\_lm\_output\_significant\_summary\_nasa)

wheat\_variable variable count

1 mean\_fe mean\_SoilTMP0\_10cm\_inst 4

2 mean\_mn mean\_Qair\_f\_inst 4

3 mean\_fe mean\_AvgSurfT\_inst 3

4 mean\_fe mean\_Qs\_acc 3

5 mean\_fe mean\_SnowT\_tavg 3

6 mean\_fe mean\_SoilTMP10\_29cm\_inst 3

7 mean\_fe mean\_SoilTMP144\_295cm\_inst 3

8 mean\_fe mean\_Tair\_f\_inst 3

9 mean\_fe mean\_Wind\_f\_inst 3

10 mean\_mg mean\_Qsm\_acc 3

11 mean\_mg mean\_Snowf\_tavg 3

12 mean\_mn mean\_SoilTMP295\_1295cm\_inst 3

13 mean\_ni mean\_Albedo\_inst 3

14 mean\_ni mean\_SWE\_inst 3

15 mean\_ni mean\_SnowDepth\_inst 3

16 mean\_s mean\_SoilTMP295\_1295cm\_inst 3

17 mean\_ca mean\_Psurf\_f\_inst 2

18 mean\_ca mean\_TWS\_inst 2

19 mean\_fe mean\_CanopInt\_inst 2

20 mean\_fe mean\_ESoil\_tavg 2

21 mean\_fe mean\_Evap\_tavg 2

22 mean\_fe mean\_Qh\_tavg 2

23 mean\_fe mean\_Qle\_tavg 2

24 mean\_fe mean\_Rainf\_f\_tavg 2

25 mean\_fe mean\_Rainf\_tavg 2

26 mean\_fe mean\_SoilTMP29\_68cm\_inst 2

27 mean\_fe mean\_SoilTMP68\_144cm\_inst 2

28 mean\_fe mean\_TVeg\_tavg 2

29 mean\_mg mean\_SWE\_inst 2

30 mean\_mg mean\_SnowDepth\_inst 2

31 mean\_mn mean\_ESoil\_tavg 2

32 mean\_mn mean\_Evap\_tavg 2

33 mean\_mn mean\_LWdown\_f\_tavg 2

34 mean\_mn mean\_Qle\_tavg 2

35 mean\_mn mean\_SoilTMP144\_295cm\_inst 2

36 mean\_mn mean\_SoilTMP29\_68cm\_inst 2

37 mean\_mn mean\_TVeg\_tavg 2

38 mean\_ni mean\_CanopInt\_inst 2

39 mean\_ni mean\_Qs\_acc 2

40 mean\_ni mean\_Qsm\_acc 2

41 mean\_ni mean\_Rainf\_f\_tavg 2

42 mean\_ni mean\_Rainf\_tavg 2

43 mean\_ni mean\_Snowf\_tavg 2

44 mean\_ni mean\_SoilMoist\_P\_inst 2

45 mean\_protein mean\_Wind\_f\_inst 2

46 mean\_s mean\_Psurf\_f\_inst 2

47 mean\_ca mean\_ESoil\_tavg 1

48 mean\_ca mean\_Evap\_tavg 1

49 mean\_ca mean\_LWdown\_f\_tavg 1

50 mean\_ca mean\_Lwnet\_tavg 1

51 mean\_ca mean\_Qair\_f\_inst 1

52 mean\_ca mean\_Qle\_tavg 1

53 mean\_ca mean\_Qs\_acc 1

54 mean\_ca mean\_SWdown\_f\_tavg 1

55 mean\_ca mean\_SoilMoist\_P\_inst 1

56 mean\_ca mean\_SoilMoist\_RZ\_inst 1

57 mean\_ca mean\_SoilMoist\_S\_inst 1

58 mean\_ca mean\_TVeg\_tavg 1

59 mean\_fe mean\_ECanop\_tavg 1

60 mean\_fe mean\_LWdown\_f\_tavg 1

61 mean\_fe mean\_Lwnet\_tavg 1

62 mean\_fe mean\_Qair\_f\_inst 1

63 mean\_fe mean\_Qg\_tavg 1

64 mean\_k mean\_Evap\_tavg 1

65 mean\_k mean\_Qsm\_acc 1

66 mean\_k mean\_SoilTMP295\_1295cm\_inst 1

67 mean\_mg mean\_Qg\_tavg 1

68 mean\_mg mean\_SoilTMP295\_1295cm\_inst 1

69 mean\_mn mean\_ACond\_tavg 1

70 mean\_mn mean\_AvgSurfT\_inst 1

71 mean\_mn mean\_Psurf\_f\_inst 1

72 mean\_mn mean\_SWdown\_f\_tavg 1

73 mean\_mn mean\_SnowT\_tavg 1

74 mean\_mn mean\_SoilMoist\_RZ\_inst 1

75 mean\_mn mean\_SoilMoist\_S\_inst 1

76 mean\_mn mean\_SoilTMP0\_10cm\_inst 1

77 mean\_mn mean\_SoilTMP10\_29cm\_inst 1

78 mean\_mn mean\_SoilTMP68\_144cm\_inst 1

79 mean\_mn mean\_Swnet\_tavg 1

80 mean\_mn mean\_Tair\_f\_inst 1

81 mean\_ni mean\_Qh\_tavg 1

82 mean\_ni mean\_SWdown\_f\_tavg 1

83 mean\_ni mean\_SoilMoist\_RZ\_inst 1

84 mean\_ni mean\_SoilMoist\_S\_inst 1

85 mean\_ni mean\_Swnet\_tavg 1

86 mean\_ni mean\_TWS\_inst 1

87 mean\_p mean\_ECanop\_tavg 1

88 mean\_p mean\_Lwnet\_tavg 1

89 mean\_p mean\_SoilTMP295\_1295cm\_inst 1

90 mean\_p mean\_Wind\_f\_inst 1

91 mean\_protein mean\_SoilTMP295\_1295cm\_inst 1

92 mean\_tkw mean\_ACond\_tavg 1

93 mean\_tkw mean\_SoilTMP295\_1295cm\_inst 1

94 mean\_tkw mean\_Wind\_f\_inst 1

>

>

> wheat\_nasa\_lm\_output\_significant\_summary <- wheat\_nasa\_lm\_output\_significant %>% group\_by(perennial\_trt, wheat\_variable) %>% summarize(count = n()) %>% arrange(desc(count))

`summarise()` has grouped output by 'perennial\_trt'. You can override using the `.groups` argument.

> as.data.frame(wheat\_nasa\_lm\_output\_significant\_summary)

perennial\_trt wheat\_variable count

1 IWG mean\_fe 20

2 Alfalfa mean\_mn 17

3 Alfalfa mean\_ni 12

4 MIX mean\_fe 12

5 AFW mean\_fe 11

6 Alfalfa mean\_ca 10

7 MIX mean\_ni 10

8 MIX mean\_mn 8

9 AFW mean\_ni 7

10 Alfalfa mean\_fe 7

11 AFW mean\_mn 6

12 AFW mean\_mg 4

13 MIX mean\_mg 4

14 AFW mean\_p 3

15 AFW mean\_ca 2

16 AFW mean\_tkw 2

17 Alfalfa mean\_k 2

18 Alfalfa mean\_mg 2

19 Alfalfa mean\_s 2

20 IWG mean\_ca 2

21 IWG mean\_mg 2

22 IWG mean\_mn 2

23 MIX mean\_ca 2

24 MIX mean\_s 2

25 AFW mean\_k 1

26 AFW mean\_protein 1

27 AFW mean\_s 1

28 Alfalfa mean\_p 1

29 Alfalfa mean\_protein 1

30 IWG mean\_tkw 1

31 MIX mean\_protein 1

>

> wheat\_nasa\_lm\_output\_significant\_summary\_trt <- wheat\_nasa\_lm\_output\_significant %>% group\_by(perennial\_trt) %>% summarize(count = n()) %>% arrange(desc(count))

> as.data.frame(wheat\_nasa\_lm\_output\_significant\_summary\_trt)

perennial\_trt count

1 Alfalfa 54

2 MIX 39

3 AFW 38

4 IWG 27

>

> wheat\_nasa\_lm\_output\_significant\_summary\_nasa <- wheat\_nasa\_lm\_output\_significant %>% group\_by(season, variable) %>% summarize(count = n()) %>% arrange(desc(count))

`summarise()` has grouped output by 'season'. You can override using the `.groups` argument.

> as.data.frame(wheat\_nasa\_lm\_output\_significant\_summary\_nasa)

season variable count

1 preseason mean\_SoilTMP295\_1295cm\_inst 8

2 postseason mean\_Qsm\_acc 4

3 preseason mean\_Wind\_f\_inst 4

4 postseason mean\_Albedo\_inst 3

5 postseason mean\_ESoil\_tavg 3

6 postseason mean\_Evap\_tavg 3

7 postseason mean\_Qle\_tavg 3

8 postseason mean\_SWE\_inst 3

9 postseason mean\_SnowDepth\_inst 3

10 postseason mean\_Snowf\_tavg 3

11 postseason mean\_TVeg\_tavg 3

12 postseason mean\_Wind\_f\_inst 3

13 season mean\_AvgSurfT\_inst 3

14 season mean\_Psurf\_f\_inst 3

15 season mean\_Qs\_acc 3

16 season mean\_SnowT\_tavg 3

17 season mean\_SoilTMP0\_10cm\_inst 3

18 season mean\_Tair\_f\_inst 3

19 postseason mean\_CanopInt\_inst 2

20 postseason mean\_Psurf\_f\_inst 2

21 postseason mean\_Qair\_f\_inst 2

22 postseason mean\_Qg\_tavg 2

23 postseason mean\_Qs\_acc 2

24 postseason mean\_Rainf\_f\_tavg 2

25 postseason mean\_Rainf\_tavg 2

26 postseason mean\_SoilTMP295\_1295cm\_inst 2

27 preseason mean\_Evap\_tavg 2

28 preseason mean\_LWdown\_f\_tavg 2

29 preseason mean\_Qair\_f\_inst 2

30 preseason mean\_SoilMoist\_P\_inst 2

31 preseason mean\_SoilTMP144\_295cm\_inst 2

32 preseason mean\_SoilTMP29\_68cm\_inst 2

33 preseason mean\_TWS\_inst 2

34 season mean\_CanopInt\_inst 2

35 season mean\_Qair\_f\_inst 2

36 season mean\_Qh\_tavg 2

37 season mean\_Qsm\_acc 2

38 season mean\_Rainf\_f\_tavg 2

39 season mean\_Rainf\_tavg 2

40 season mean\_SWE\_inst 2

41 season mean\_SnowDepth\_inst 2

42 season mean\_Snowf\_tavg 2

43 season mean\_SoilTMP10\_29cm\_inst 2

44 season mean\_SoilTMP144\_295cm\_inst 2

45 season mean\_SoilTMP68\_144cm\_inst 2

46 postseason mean\_ACond\_tavg 1

47 postseason mean\_AvgSurfT\_inst 1

48 postseason mean\_LWdown\_f\_tavg 1

49 postseason mean\_Lwnet\_tavg 1

50 postseason mean\_SWdown\_f\_tavg 1

51 postseason mean\_SnowT\_tavg 1

52 postseason mean\_SoilMoist\_RZ\_inst 1

53 postseason mean\_SoilMoist\_S\_inst 1

54 postseason mean\_SoilTMP0\_10cm\_inst 1

55 postseason mean\_SoilTMP10\_29cm\_inst 1

56 postseason mean\_SoilTMP144\_295cm\_inst 1

57 postseason mean\_SoilTMP29\_68cm\_inst 1

58 postseason mean\_Swnet\_tavg 1

59 postseason mean\_Tair\_f\_inst 1

60 preseason mean\_ACond\_tavg 1

61 preseason mean\_ECanop\_tavg 1

62 preseason mean\_ESoil\_tavg 1

63 preseason mean\_Lwnet\_tavg 1

64 preseason mean\_Qh\_tavg 1

65 preseason mean\_Qle\_tavg 1

66 preseason mean\_Qs\_acc 1

67 preseason mean\_SWdown\_f\_tavg 1

68 preseason mean\_SoilMoist\_RZ\_inst 1

69 preseason mean\_SoilMoist\_S\_inst 1

70 preseason mean\_SoilTMP0\_10cm\_inst 1

71 preseason mean\_SoilTMP10\_29cm\_inst 1

72 preseason mean\_SoilTMP68\_144cm\_inst 1

73 preseason mean\_TVeg\_tavg 1

74 season mean\_ECanop\_tavg 1

75 season mean\_ESoil\_tavg 1

76 season mean\_Evap\_tavg 1

77 season mean\_LWdown\_f\_tavg 1

78 season mean\_Lwnet\_tavg 1

79 season mean\_Qle\_tavg 1

80 season mean\_SWdown\_f\_tavg 1

81 season mean\_SoilMoist\_P\_inst 1

82 season mean\_SoilMoist\_RZ\_inst 1

83 season mean\_SoilMoist\_S\_inst 1

84 season mean\_SoilTMP295\_1295cm\_inst 1

85 season mean\_SoilTMP29\_68cm\_inst 1

86 season mean\_Swnet\_tavg 1

87 season mean\_TVeg\_tavg 1

88 season mean\_TWS\_inst 1

>

> wheat\_nasa\_lm\_output\_significant\_summary\_nasa <- wheat\_nasa\_lm\_output\_significant %>% group\_by(variable) %>% summarize(count = n()) %>% arrange(desc(count))

> as.data.frame(wheat\_nasa\_lm\_output\_significant\_summary\_nasa)

variable count

1 mean\_SoilTMP295\_1295cm\_inst 11

2 mean\_Wind\_f\_inst 7

3 mean\_Evap\_tavg 6

4 mean\_Qair\_f\_inst 6

5 mean\_Qs\_acc 6

6 mean\_Qsm\_acc 6

7 mean\_ESoil\_tavg 5

8 mean\_Psurf\_f\_inst 5

9 mean\_Qle\_tavg 5

10 mean\_SWE\_inst 5

11 mean\_SnowDepth\_inst 5

12 mean\_Snowf\_tavg 5

13 mean\_SoilTMP0\_10cm\_inst 5

14 mean\_SoilTMP144\_295cm\_inst 5

15 mean\_TVeg\_tavg 5

16 mean\_AvgSurfT\_inst 4

17 mean\_CanopInt\_inst 4

18 mean\_LWdown\_f\_tavg 4

19 mean\_Rainf\_f\_tavg 4

20 mean\_Rainf\_tavg 4

21 mean\_SnowT\_tavg 4

22 mean\_SoilTMP10\_29cm\_inst 4

23 mean\_SoilTMP29\_68cm\_inst 4

24 mean\_Tair\_f\_inst 4

25 mean\_Albedo\_inst 3

26 mean\_Lwnet\_tavg 3

27 mean\_Qh\_tavg 3

28 mean\_SWdown\_f\_tavg 3

29 mean\_SoilMoist\_P\_inst 3

30 mean\_SoilMoist\_RZ\_inst 3

31 mean\_SoilMoist\_S\_inst 3

32 mean\_SoilTMP68\_144cm\_inst 3

33 mean\_TWS\_inst 3

34 mean\_ACond\_tavg 2

35 mean\_ECanop\_tavg 2

36 mean\_Qg\_tavg 2

37 mean\_Swnet\_tavg 2

>