How Weather Affects the Game

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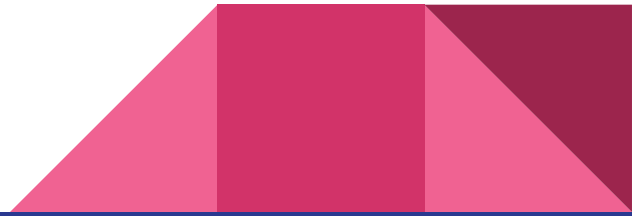
Background

In a highly competitive environment, NFL franchises always try to get any advantage on the opposing team as they can

Any edge gained on the other teams can increase the probability of winning, which is naturally desired by all organizations

To help get this edge, most teams look to gather as much data as possible and look for trends



The Weather

The weather on game day is one of the factors in a game that nobody can control

Playing in variant weather can cause stress on the body

There exists an “ideal weather” for each team (ex. teams in Florida are accustomed to warm weather)

Finding how the opponents react in deviations from the weather could give teams an advantage

What Can Weather Do?

Cold weather (especially for warm acclimated teams) can cause muscle tightness, slower twitch reactions and many other hindrances

Warm weather (especially for cold acclimated teams) can cause over stretching, dehydration and exhaustion

Storm conditions (wind and precipitation) can make passing harder and can cause grip to be lost on surfaces

What can this mean?

Passing tends to be a play that is harder to control in more extreme weather conditions

If the weather “sucks”, teams might look to pass less and rush more

Conversely, it’s harder to run the ball in rain and snow, so in these conditions, a team might look to pass

If a team could find out what’s going to happen in given weather conditions, they could mold their game plan to combat what the other team will do

Data

To look at the effects of the weather on the game, the game's outcome can be looked at in various measurements and the weather can be broken up into its components

Weather is initially broken up into temperature, humidity, temperature difference from the team in question's average temperature and wind speed with a binary measure for precipitation and having a dome

A team's performance is gauged on their offensive and defensive passing and rushing yards

- R is a programming language for statistical computing and graphics.

- Python libraries & packages:

Pandas: Data manipulation and analysis. Offers data structures and operations for manipulating numerical tables and time series.

Beautiful Soup: HTML and XML parser. It creates a parse tree for parsed pages that can be used to extract data from HTML.

- Jupyter Notebook is an open-source web application that allows you to create documents that contain live code, equations, visualizations and narrative text.

2000 St. Louis Rams Statistics & Players

‹‹ Previous Season | Next Season ››

via Sports Logos.net
About logos

Record: 10-6-0, 2nd in NFC West Division (Schedule and Results)
Coach: Mike Martz (10-6-0)
Points For: 540 (33.8/g) 1st of 31
Points Against: 471 (29.4/g) 31st of 31
Expected W-L: 9.3-6.7
SRS: 3.14 (10th of 31), SOS: -1.17
Playoffs:
Lost Wild Card 28-31 vs. New Orleans Saints
Offensive Coordinator: Bobby Jackson

More Team Info ▾

Franchise Encyclopedia | 2000 Rams Statistics | Starters & Roster | Games & Schedule | Team Draftees | More ▾

On this page:

Team Stats and Rankings | Schedule & Game Results | Team Conversions
Passing | Rushing & Receiving | Kick & Punt Returns
Kicking & Punting | Defense & Fumbles | Scoring Summary
Touchdown Log | Opponent Touchdown Log | Full Site Menu

Team Stats and Rankings

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			Tot Yds & TO					Passing							Rushing					Penalties					Average Dri		
Player	PF	Yds	Ply	Y/P	TO	FL	1stD	Cmp	Att	Yds	TD	Int	NY/A	1stD	Att	Yds	TD	Y/A	1stD	Pen	Yds	1stPy	#Dr	Sc%	TO%	Start	Time	Play
Team Stats	540	7075	1014	7.0	35	12	380	380	587	5232	37	23	8.3	247	383	1843	26	4.8	112	111	942	21	186	46.8	16.7	Own 30.6	2:39	5.6
Opp. Stats	471	5494	968	5.7	25	6	321	323	534	3797	32	19	6.5	195	383	1697	18	4.4	95	101	747	31	186	40.9	12.4	Own 33.3	2:30	5.4
Lg Rank Offense	1	1			24	14	2	3	1	1	28	1			25	17	1	2					1	8	23	8		10
Lg Rank Defense	31	23			20	30	24	17	27	30	11	28			4	13	27	25					2	22	25	15		14

Schedule & Game Results

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									Score		Offense					Defense					Exp
Week	Day	Date			OT	Rec		Opp	Tm	Opp	1stD	TotYd	PassY	RushY	TO	1stD	TotYd	PassY	RushY	TO	Offense
1	Mon	September 4	9:07PM ET	boxscore	W		1-0		Denver Broncos	41	36	23	513	433	80	3	25	424	274	150		19.93
2	Sun	September 10	4:15PM ET	boxscore	W		2-0	@	Seattle Seahawks	37	34	28	476	379	97	1	24	338	237	101	3	14.71
3	Sun	September 17	1:02PM ET	boxscore	W		3-0		San Francisco 49ers	41	24	32	529	389	140	2	16	401	290	111	2	20.53
4	Sun	September 24	1:02PM ET	boxscore	W		4-0	@	Atlanta Falcons	41	20	14	395	321	74	2	18	286	218	68	4	14.05
5	Sun	October 1	1:02PM ET	boxscore	W		5-0		San Diego Chargers	57	31	29	614	451	163		23	381	333	48	2	38.52
6									**Bye Week**													
7	Sun	October 15	1:02PM ET	boxscore	W		6-0		Atlanta Falcons	45	29	29	529	302	227	1	21	259	198	61	1	27.23
8	Sun	October 22	1:00PM ET	boxscore	L		6-1	@	Kansas City Chiefs	34	54	24	428	362	66	4	21	468	362	106		5.71
9	Sun	October 29	4:05PM ET	boxscore	W		7-1	@	San Francisco 49ers	34	24	22	447	298	149	1	15	325	233	92		9.62
10	Sun	November 5	8:35PM ET	boxscore	L		7-2		Carolina Panthers	24	27	20	426	395	31	2	18	268	178	90	2	11.06
11	Sun	November 12	4:15PM ET	boxscore	W		8-2	@	New York Giants	38	24	28	397	256	141	1	14	348	213	135	3	7.19
12	Mon	November 20	9:08PM ET	boxscore	L		8-3		Washington Redskins	20	33	18	394	344	50	3	21	400	262	138	1	3.25
13	Sun	November 26	1:02PM ET	boxscore	L		8-4		New Orleans Saints	24	31	21	279	251	28	4	23	332	185	147	2	-5.20
14	Sun	December 3	1:04PM ET	boxscore	L		8-5	@	Carolina Panthers	3	16	15	278	179	99	7	20	237	169	68	2	-25.39
15	Sun	December 10	4:15PM ET	boxscore	W		9-5		Minnesota Vikings	40	29	32	508	346	162		23	312	208	104		32.43
16	Mon	December 18	9:00PM ET	boxscore	L		9-6	@	Tampa Bay Buccaneers	35	38	19	388	298	90	3	27	446	241	205	2	13.97
17	Sun	December 24	1:02PM ET	boxscore	L		10-6	@	New Orleans Saints	26	21	26	474	228	246	1	12	269	196	73	1	8.15
		Playoffs																				
Wild Card	Sat	December 30	4:05PM ET	boxscore	L		10-7	@	New Orleans Saints	28	31	17	384	350	34	5	17	301	251	50	2	-2.07

Team Conversions

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	Downs						Red Zone		
Player	3DAtt	3DConv	3D%	4DAtt	4DConv	4D%	RZAtt	RZTD	RZPct
Team Stats	181	86	47.5	13	8	61.5	78	49	62.8
Opp. Stats	192	74	38.5	12	6	50.0	58	34	58.6
Lg Rank Offense			1			6			1
Lg Rank Defense			17			15			25

jupyter WorkingDataScrapping Last Checkpoint: 14 minutes ago (unsaved changes)

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Run Code

In [ ]:

```
import pandas as pd
urlhead = 'http://www.pro-football-reference.com/teams/'
urltail = '.htm'
newcolumns=['Week','Day','Date','NA1','NA2','W/L','NA4','REC','LOC','Opp','Score_Team','Score_Opp','O_1stD','O_TotYd','O_PassY',
drop = ['Day','REC','NA1','NA2','NA4','Expected_O_Pts','Expected_Sp_Pts','Expected_D_Pts','O_TO','D_TO','O_1stD','D_1stD']
allteams = ["ram","den","sea","sfo","atl","sdg","kan","car","nyg","was","nor","min","tam","nwe","buf","nyj","mia","rav","pit","c
allyears = ["2009","2010","2011","2012","2013","2014","2015","2016","2017","2018"]

def createDF(url):
    dfs = pd.read_html(url)
    df = dfs[1]
    df.columns = [' '.join(col).strip() for col in df.columns.values]
    df.columns=newcolumns
    df['LOC'] = df['LOC'].fillna(value=0)
    df['LOC'] = df['LOC'].replace(0,'Home')
    df['LOC'] = df['LOC'].replace('@','Away')
    df=df.drop(drop,axis=1)
    bye_idx = df.index[df['Opp'].str.match('Bye',na=False)]
    df = df.drop(bye_idx,axis = 0)
    df = df.head(16)
    df.set_index('Week')
    print(df)
    return df


def csvLoop():
    for x in range(len(allteams)):
        team = allteams[x]
        for y in range(len(allyears)):
            year = allyears[y]
            url = urlhead + team + '/' + year + urltail
            file = team + '_' + year + '.csv'
            createDF(url).to_csv(file,index=False)

csvLoop()
```

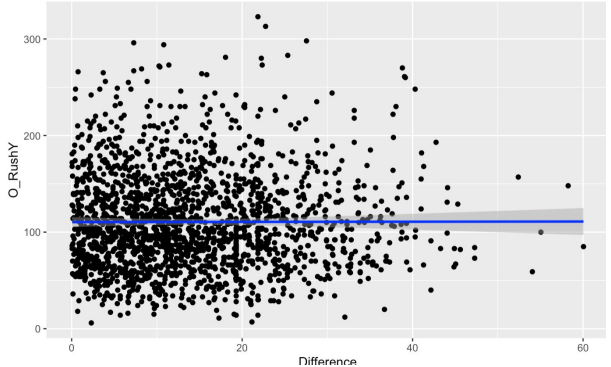
```
In [9]: createDF("https://www.pro-football-reference.com/teams/ram/2000.htm#games")
```

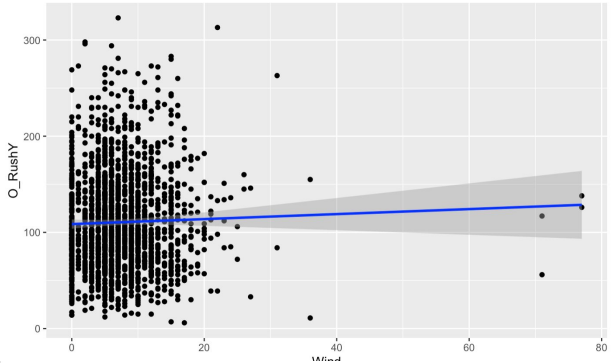
Out[9]:

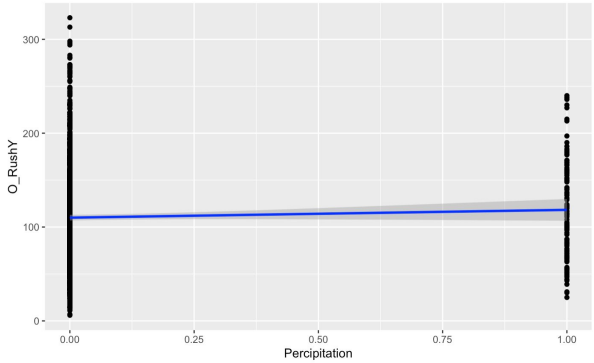
	Week	Date	W/L	LOC	Opp	Score_Team	Score_Opp	O_TotYd	O_PassY	O_RushY	D_TotYd	D_PassY	D_RushY
0	1	September 4	W	Home	Denver Broncos	41.0	36.0	513.0	433.0	80.0	424.0	274.0	150.0
1	2	September 10	W	Away	Seattle Seahawks	37.0	34.0	476.0	379.0	97.0	338.0	237.0	101.0
2	3	September 17	W	Home	San Francisco 49ers	41.0	24.0	529.0	389.0	140.0	401.0	290.0	111.0
3	4	September 24	W	Away	Atlanta Falcons	41.0	20.0	395.0	321.0	74.0	286.0	218.0	68.0
4	5	October 1	W	Home	San Diego Chargers	57.0	31.0	614.0	451.0	163.0	381.0	333.0	48.0
6	7	October 15	W	Home	Atlanta Falcons	45.0	29.0	529.0	302.0	227.0	259.0	198.0	61.0
7	8	October 22	L	Away	Kansas City Chiefs	34.0	54.0	428.0	362.0	66.0	468.0	362.0	106.0
8	9	October 29	W	Away	San Francisco 49ers	34.0	24.0	447.0	298.0	149.0	325.0	233.0	92.0
9	10	November 5	L	Home	Carolina Panthers	24.0	27.0	426.0	395.0	31.0	268.0	178.0	90.0
10	11	November 12	W	Away	New York Giants	38.0	24.0	397.0	256.0	141.0	348.0	213.0	135.0
11	12	November 20	L	Home	Washington Redskins	20.0	33.0	394.0	344.0	50.0	400.0	262.0	138.0
12	13	November 26	L	Home	New Orleans Saints	24.0	31.0	279.0	251.0	28.0	332.0	185.0	147.0
13	14	December 3	L	Away	Carolina Panthers	3.0	16.0	278.0	179.0	99.0	237.0	169.0	68.0
14	15	December 10	W	Home	Minnesota Vikings	40.0	29.0	508.0	346.0	162.0	312.0	208.0	104.0
15	16	December 18	L	Away	Tampa Bay Buccaneers	35.0	38.0	388.0	298.0	90.0	446.0	241.0	205.0
16	17	December 24	W	Away	New Orleans Saints	26.0	21.0	474.0	228.0	246.0	269.0	196.0	73.0

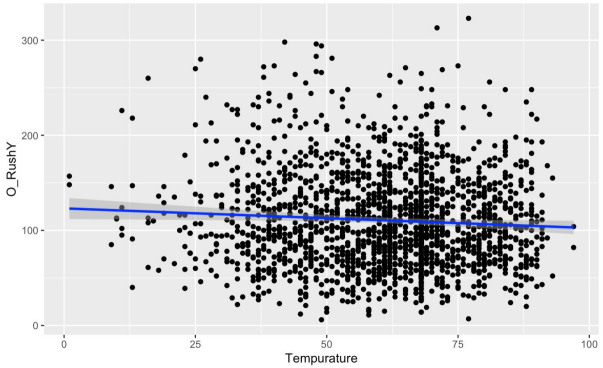
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Year	Team	Opp	Score_Team	Score_Opp	O_TotYd	O_PassY	O_RushY	D_TotYd	D_PassY	D_RushY	Tempurature	Humidity	Wind	Percipitation	Average Temp (1st team)	Difference
2	2018	Arizona Cardinals	Los Angeles Rams	0	34	137	83	54	432	342	90	86	35	2	0	75.05	10.95
3	2018	Arizona Cardinals	San Francisco 49ers	28	18	220	164	56	447	300	147	79	19	15	0	75.05	3.95
4	2018	Arizona Cardinals	Denver Broncos	10	45	223	154	69	309	178	131	82	27	6	0	75.05	6.95
5	2018	Arizona Cardinals	Kansas City Chiefs	14	26	260	166	94	330	212	118	43	51	5	0	75.05	32.05
6	2018	Arizona Cardinals	Oakland Raiders	21	23	282	128	154	325	173	152	72	20	3	0	75.05	3.05
7	2018	Arizona Cardinals	Los Angeles Chargers	10	45	149	87	62	414	236	178	74	52	3	0	75.05	1.05
8	2018	Arizona Cardinals	Green Bay Packers	20	17	315	133	182	325	227	98	34	92	20	0	75.05	41.05
9	2018	Arizona Cardinals	Detroit Lions	3	17	279	218	61	218	96	122	70	41	2	0	75.05	5.05
10	2018	Arizona Cardinals	Los Angeles Rams	9	31	263	159	104	461	192	269	72	22	0	0	75.05	3.05
11	2018	Arizona Cardinals	Seattle Seahawks	24	27	198	113	85	291	109	182	45	76	5	0	75.05	30.05
12	2017	Arizona Cardinals	Detroit Lions	23	35	308	263	45	367	285	82	68	70	0	0	75.05	7.05

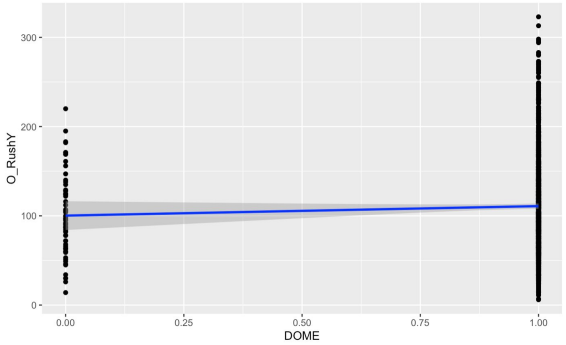
Results For Rushing

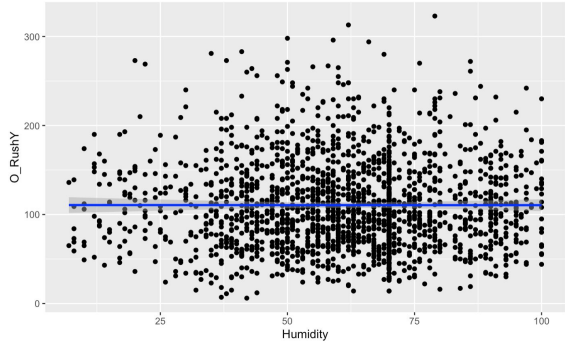












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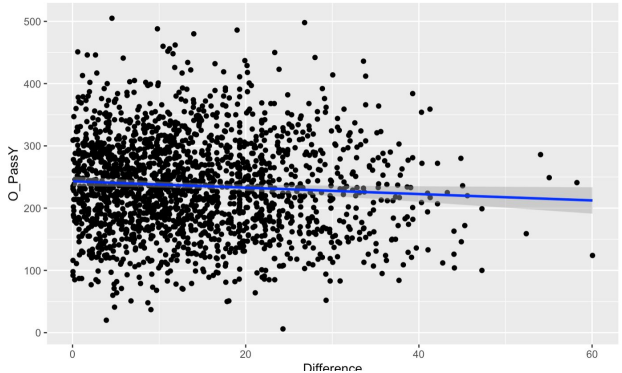

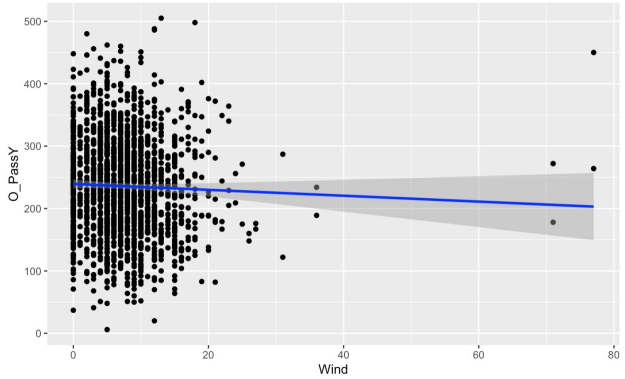

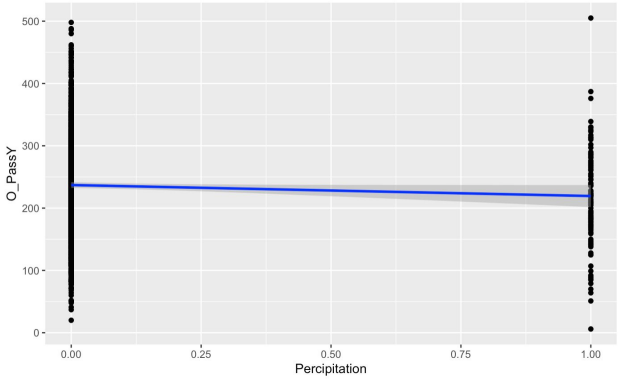

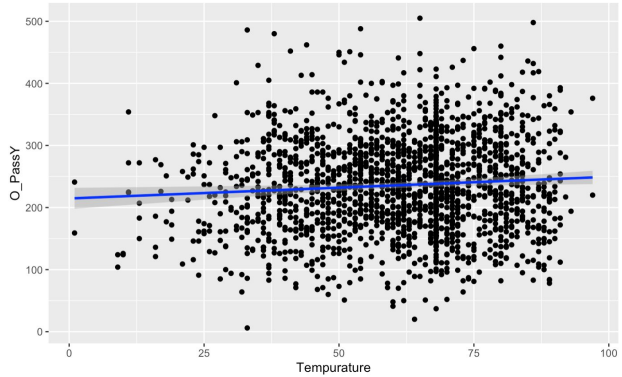

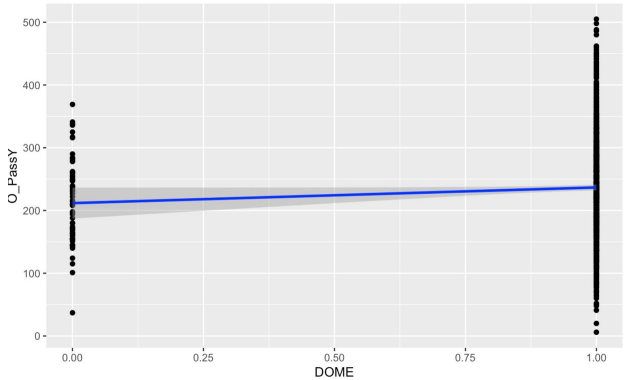

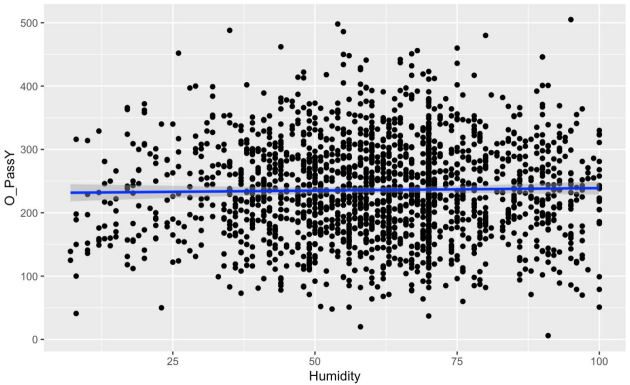

R Output

```
Call:
lm(formula = O_PassY ~ Tempurature + Difference + Percipitation +
    Humidity)

Residuals:
     Min       1Q   Median       3Q      Max
-223.456  -53.114   -2.161   51.396  275.889

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   209.98028    9.72783  21.586  < 2e-16 ***
Tempurature     0.37081    0.10586   3.503 0.000471 ***
Difference     -0.54656    0.17459  -3.131 0.001771 **
Percipitation -21.93625    7.50127  -2.924 0.003493 **
Humidity        0.20475    0.09745   2.101 0.035772 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 75.88 on 1893 degrees of freedom
Multiple R-squared:  0.01602,   Adjusted R-squared:  0.01394
F-statistic: 7.704 on 4 and 1893 DF,  p-value: 3.72e-06
```

```
Call:
lm(formula = O_RushY ~ Tempurature + Percipitation + Humidity)

Residuals:
     Min       1Q   Median       3Q      Max
-107.686  -36.225   -6.829   29.201  217.572

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   126.61470    6.18646  20.466  < 2e-16 ***
Tempurature    -0.20647    0.06964  -2.965  0.00307 **
Percipitation   8.80005    4.93498   1.783  0.07471 .
Humidity       -0.06695    0.06409  -1.045  0.29637
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 49.95 on 1894 degrees of freedom
Multiple R-squared:  0.006525,  Adjusted R-squared:  0.004951
F-statistic: 4.146 on 3 and 1894 DF,  p-value: 0.006126
```

Getting Rid of the Dome

The results were also looked at without a dome variable

Having the dome will mostly reflect only teams that own a dome (in essence looking at how they perform in the weather instead of the whole NFL)

Removing the variable involved getting rid of every game that was played in a dome

No Dome Calculations for passing

```
Call:
lm(formula = O_PassY ~ Tempurature + Humidity + Difference +
    Percipitation + Wind)

Residuals:
     Min       1Q   Median       3Q      Max
-222.439  -52.720   -2.636   52.694  277.993

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)   213.32150   10.44323  20.427  < 2e-16 ***
Tempurature     0.38295    0.10694   3.581 0.000351 ***
Humidity        0.22668    0.09874   2.296 0.021800 *
Difference     -0.56320    0.17640  -3.193 0.001433 **
Percipitation -23.30743    7.53885  -3.092 0.002021 **
Wind           -0.52848    0.30845  -1.713 0.086822 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 75.94 on 1828 degrees of freedom
Multiple R-squared:  0.02029,    Adjusted R-squared:  0.01761
F-statistic: 7.571 on 5 and 1828 DF,  p-value: 4.755e-07
```

```
Call:
lm(formula = O_PassY ~ Tempurature + Humidity + Difference +
    Percipitation + Wind)

Residuals:
    Min      1Q  Median      3Q     Max
-222.10  -53.11   -2.40   52.12  277.53

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)   213.66412   10.42783  20.490  < 2e-16 ***
Tempurature     0.35821    0.10664   3.359 0.000797 ***
Humidity        0.19310    0.09817   1.967 0.049332 *
Difference     -0.55000    0.17463  -3.150 0.001660 **
Percipitation -21.47955    7.51578  -2.858 0.004311 **
Wind           -0.29513    0.30090  -0.981 0.326814
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 75.88 on 1892 degrees of freedom
Multiple R-squared:  0.01652,    Adjusted R-squared:  0.01392
F-statistic: 6.356 on 5 and 1892 DF,  p-value: 7.329e-06
```

Results/Conclusion

With the visuals on the graph and the low R-squared value, there is little correlation to the weather and the number of yards that are produced

With that being said, there is still a couple of inches to be gained, in that there is some decrease/increase in certain areas

Using those couple inches on another team, a team could get a slight advantage which may help in certain scenarios

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