Appendix: Results

May 20, 2020

Contents

1 Introduction

The objective of this supplement is to provide detail on the analysis of County Equivalent (CCE) characteristics in the historical and present-day time periods. We begin by describing the data used to assess the differences in CCE characteristics across lands in the two time periods. We then detail the methods used to compare the CCEs across time along a suite of characteristics: climate, mineral access, and proximity to federal lands. Finally, we present the results of our analyses as well as assess the robustness of the results.

2 Data Descriptions

We focus on land characteristics that are either durable over long time periods or not heavily impacted by the human inhabitants of the land. We divide the characteristics into categories: climate, mineral resource access, and national lands. The set of climate characteristics consist of number of extreme temperature days, drought, precipitation, and a measure of wildfire hazard potential. The set of mineral resource access characteristics include access to oil and gas basins, oil and gas production, and number of wells. Finally, we assess the proximity of historical and present-day CCEs to federal lands. The following sections describe the data sources and any processing to construct the variables for analysis.

Table 1 contains summary statistics for the dataset used in the analyses. However, there are many instances where a tribe is present in only the present-day set or the historical set. We also present the summary statistics of a dataset with only tribes present in both periods. Table 2 contains the summary statistics of the Present-day and Historical dataset. While the number of observations is clearly smaller in the dataset with tribes present in both periods, the distribution of the datasets is very similar suggesting that these tribes who enter or exit the dataset are not systematically different from those in both periods with regard to our CCE characteristics.

2.1 Heat

The National Weather Service's Heat Index incorporates both relative humidity and actual air temperature to describe how hot the temperature feels in degrees Farenheit. We utilize Dahl et al.'s measure of the average number of days per year between 1971 to 2000 that the Heat Index is greater than 100 degrees Farenheit.

National Weather Service, Heat Index, (available at https://www.weather.gov/safety/heat-index).

Dahl, Kristina, Erika Spanger-Siegfried, Rachel Licker, Astrid Caldas, John Abatzoglou, Nicholas Mailloux, Rachel Cleetus, Shana Udvardy, Juan Declet-Barreto, and Pamela Worth. 2019. Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days. Cambridge, MA: Union of Concerned Scientists.

2.2 Drought

We measure drought conditions as the Palmer Drought Severity Index (PDSI). The PDSI is a unitless measure which assesses exposure to drought and ranges from -10 (extreme drought) to +10 (extreme wet). We gather weekly PDSI measures gridded (4km resolution) across the continental US from gridMET (Abatzoglou, 2013). First, we construct CCE weekly PDSI averages using GIS to spatially intersect CCE boundaries with gridded weather. Second, we calculate weekly decadal averages. We construct the variable *Drought* by taking the difference between the 2010 and 1980 decadal averages for each CCE in the continental US. This variable captures the long-term climate impacts on CCEs.

2.3 Precipitation

Oregon State University's PRISM Climate Group calcualtes average precipitation (inches) over 30-year time periods. We use data that is calculated between 1981 and 2010.

PRISM Climate Group, Northwest Alliance for Computational Science and Engineering, PRISM Climate Data, (available at http://prism.oregonstate.edu/).

2.4 Wildfire Hazard Potential

A changing climate is expected to alter wildfire behavior in the US, and particularly in the Western US (Abazoglou and Williams, 2016; Westerling et al. 2006). We construct a measure of wildfire risk using a gridded (270 meter) index called Wildfire Hazard Potential (WHP) (Dillon, 2018). The WHP is a discrete scale from 1 (very low fire hazard potential) to 5 (very high hazard potential) designed to inform fuel planning efforts. We choose this measure because it synthesizes many ecological, geographic, and atmospheric factors into a single index. We calculate the mean WHP of all grid cells within the county boundary.

2.5 Oil and Gas Basins

The U.S. Energy Information Administration provides a map of sedimentary basin boundaries within the continental United States. Using this map, we construct a binary variable which describes whether a CCE does or does not overlap an oil or gas basin.

Oil and Gas Exploration, Resources, and Production. U.S. Energy Information Administration, (available at https://www.eia.gov/maps/maps.htm).

2.6 Oil and Gas Production

The U.S. Department of Agriculture reports gross withdrawls of oil and gas at the county level between 2000 and 2011. We take the average count of barrels of oil produced and million cubic feet of natural gas extracted over this time period.

County-level Oil and Gas Production in the U.S. U.S. Department of Agriculture Economic Research Service. Available at: https://www.ers.usda.gov/data-products/county-level-oil-and-gas-production-in-the-us/.

2.7 Oil and Gas Wells

The U.S. Geological Survey reports all known well locations across the continental United States between 1859 and 2005. We calculate the total number of wells drilled in each CCE over this 146-year period.

Biewick, Laura R.H., 2008, Areas of historical oil and gas exploration and production in the United States: U.S. Geological Survey Digital Data Series DDS-69-Q.

2.8 Federal Lands

The U.S. Geological Survey's Protected Lands Database of the U.S. (PAD-US) is a spatial inventory of all formally protected lands. We select only lands protected by the Federal Government (e.g. national parks, national forests, etc.). We calculate total proportion of a CCE's land area which is designated as any type of federally protected area.

U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2018, Protected Areas Database of the United States (PAD-US): U.S. Geological Survey data release, https://doi.org/10.5066/P955KPLE.

Table 1: Full Dataset

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Number of CCEs	10,528	115.70	100.92	0	21	182	383
Days over 100F	10,309	5.81	8.97	0.00	0.00	7.00	72.00
Drought	10,307	−0.20	0.46	−1.38	−0.56	0.11	1.17
Precipitation	10,271	912.44	415.70	83.68	590.45	1,124.35	2,960.78
Wildfire Hazard Potential	10,307	1.28	0.96	0.06	0.50	1.91	4.03
Oil and Gas Basin	8,733	0.57	0.50	0.00	0.00	1.00	1.00
Oil Production	10,313	760.66	8,169.69	0.00	0.00	26.65	175,321.50
Gas Production	10,313	5,624.71	33,347.47	0.00	0.00	100.17	856,112.30
Well Count	8,733	272.81	534.97	0.00	3.00	342.00	7,743.00
Fraction Federal Land	10,314	0.07	0.17	0.00	0.00	0.03	1.05

Table 2: Present-day and Historical Dataset

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Number of CCEs	8,165	135.95	102.56	1	41	215	383
Days over 100F	8,160	5.71	9.25	0.00	0.00	7.00	72.00
Drought	8,158	−0.18	0.43	−1.38	−0.50	0.10	1.16
Precipitation	8,137	898.80	427.44	83.68	572.24	1,096.15	2,960.78
Wildfire Hazard Potential	8,158	1.22	0.90	0.06	0.49	1.77	4.03
Oil and Gas Basin	7,307	0.59	0.49	0.00	0.00	1.00	1.00
Oil Production	8,164	543.17	5,189.78	0.00	0.00	37.34	175,321.50
Gas Production	8,164	6,422.58	36,440.70	0.00	0.00	153.16	856,112.30
Well Count	7,307	300.27	569.97	0.00	4.00	405.00	7,743.00
Fraction Federal Land	8,165	0.08	0.18	0	0	0.04	1

3 Methods

We employ several statistical methods to test whether characteristics of the historical lands differ from the present-day lands. Our primary method to compare the historical and present-day CCEs is a linear regression of the CCE characteristic as a function of a binary indicator for present-day lands (and an intercept), which amounts to simple ANOVA test of whether the means are equal in the historical and present-day CCEs. The intercept in these models is the mean of the CCE characteristic in the historial period while the present-day coefficient represents the change from the historical to the present-day period. All statistical tests are conducted using cluster-robust standard errors, which account for heteroskedasticity and serial correlation that may exist within a tribe due to the proximity of CCEs within a tribe's historical or present-day extent.

We assess the robustness of our estimate using several alternative model specifications and two forms of the data: 1) only tribes with records in the present-day and historical period, and 2) all tribes including those with records in only one time period (denoted Full in the following tables). In each table below, we present a set of the following models:

- OLS: Ordinary Least Squares (OLS) model using only data on tribes with records in the historical and present-day periods.
- Weighted OLS: weighted OLS model using only data on tribes with records in the historical and present-day periods. We construct weights as the inverse of the total number of CCEs associated with a tribe in each time period. The weighted regression model effectively places equal weight on each tribe given that the number of CCEs varies with the historical range of the tribe. Larger, more dominant, or tribes with CCEs in the Eastern US may include more CCEs, which effectively increases the weight on those tribes in a simple regression setting. By weighting the observations, the results can be interpretted as a tribe-level analysis.
- Full OLS: OLS model using the full dataset, which includes tribes present in either the historical or present-day periods. The full dataset increases the sample size but may introduce bias due to the dissolution and formation of tribes between our time periods.
- Full Weighted OLS: weighted OLS model using the full dataset.
- Poisson: a Poisson regression when the data are integer count data.
- Tribe FE: an OLS regression with tribe fixed effects. The fixed effect regression estimates tribe-specific means in the historical period, but a common coefficient on the difference between the historical and present-day periods. This model would control for unobserved factors within a tribe that may influence any relocation policy and thus the characteristics of the CCEs in both the historical and present-day periods.
- BEZI: zero-inflated Beta regression when the dependent variable is bounded between zero and one (e.g., percent).

4 Results

This section presents the results of the analysis along with several robustness checks. Throughout the text 95% confidence intervals are presented as [lower,upper].

4.1 CCEs Inhabited

We compare the spatial extent of tribe's historical and present-day areas as measured by the number of CCEs. We estimate the difference between the number of CCEs reported as historical lands and the number of CCEs reported as present-day lands using several regression models to assess the robustness of the relationship.

Table 3: Extent of Area Occupied

	Dependent Variable: Number of CCEs				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Poisson
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	146.70***	40.87***	125.59***	24.16***	4.99***
	(115.38, 178.02)	(31.35, 50.40)	(98.04, 153.14)	(19.28, 29.04)	(4.77, 5.20)
Present-day Change	−136.30***	−37.38***	−117.75***	−22.41***	−2.65***
	(−164.31, −108.29)	(−46.52, −28.23)	(−142.69, −92.81)	(−27.08, −17.73)	(−2.96, −2.33)
Obs	8,165	8,165	10,528	10,528	8,165

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

The results in Table 3 indicate that tribes occupied far fewer CCEs in the present period relative to the historical period. The results in column 1 suggest that tribes occupied an average of 146.7 CCEs during the historical period. By the present day, the average number of CCEs fell by 136.303 (a 92.9% reduction). The relationship is robust to all specifications. However, the results of column 2 (weighted OLS) indicate that the abolute estimated effect is heavily influenced by large tribes, yet the percentage reduction in CCEs is of similar magnitude (91.4%).

4.2 Heat

The results in Table 4 suggest that the present-day lands experience 2-3 more days in excess of 100 degrees per year compared to historical lands. The point estimates range from 2.60 [0.73, 4.47] from the OLS model to 2.92 [1.00, 4.83] from the Full OLS model. The coefficients of the Poisson model are not directly comparable to the OLS estimates. The model suggests that historical lands experience about 5.5 (5.5=exp(1.705)) days a year over 100 degrees, while the present-days lands experience 2.5 (2.5=exp(1.705)*(exp(.387)-1)) additional days over 100, which is comparable to the OLS estimates. The results of the Weighted OLS and Full Weighted OLS models show not statistically significant difference. This lack of significance of the weighted models indicates that difference is driven by tribes that have large CCE extents, which likely corresponds to population.

4.3 Drought

Table 5 present the results of the analysis of differences in drought across the historical and present-day lands. Our variable is the change in drought over time. The coefficients on Historical indicate that even the historical lands are experiencing more drought. The coefficients on present-day change indicate that present day lands are becoming even drier. OLS, Weighted OLS, Full OLS, and Tribe Fixed Effects models all indicate that present-day lands are about twice as dry as historical lands, with point estimates ranging between -0.11 (Weighted OLS) and -0.18 (OLS).

4.4 Precipitation

Table 6 present the results of the analysis of precipitation across the historical and present-day lands. The coefficients on Historical indicate that the historical lands experience 800-950mm of precipitation each year. While the estimates in the unweighted models are statistically insignificant, the weighted models suggest a decrease in precipitation of around 150 mm per year. These results suggest that more tribes, rather than the populations, experience less precipitation.

4.5 Wildfire Hazard Potential

The results in table 7 suggest that present-day lands have higher wildfire hazard potential (WHP) compared to historical lands. The coefficients on Historical indicate that the historical lands have an average WHP rating of around 1 on a scale of 1 (very low fire hazard potential) to 5 (very high hazard potential). The results indicate that the present-day lands have a higher WHP than the historical lands by 0.55 points on the index, a 47% increase. This estimate is robust to several alternative specifications. In fact, the weighted models suggest an even larger difference suggesting that tribes with larger CCEs were less affected than others. While wildfire hazard potential is a function of the natural environment, it is also influenced by human modifications of the natural and built environment.

4.6 Oil and Gas Basins

We evaluate access to oil and gas based on the likelihood that a tribe's CCEs lie over subsurface oil and gas. Our main specification, OLS, in Table 8 (column 1) indicates that present-day lands are 11% [0.20, 0.01] less

Table 4: Extreme Heat

	Dependent Variable: Days per Year in excess of 100 degrees F				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Poisson
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	5.50***	4.75***	5.61***	4.72***	1.71***
	(4.10, 6.91)	(3.30, 6.20)	(4.46, 6.76)	(3.85, 5.58)	(1.45, 1.96)
Present-day Change	2.60***	2.54***	2.92***	2.88***	0.39***
	(0.73, 4.47)	(1.60, 3.48)	(1.00, 4.83)	(1.56, 4.20)	(0.15, 0.63)
Obs	8,160	8,160	10,309	10,309	8,160

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

Table 5: Drought

	Dependent Variable: Median PDSI				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Tribe FE
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	-0.16^{***}	-0.28^{***}	-0.19^{***}	-0.42^{***}	
	$(-0.23, -0.09)$	$(-0.32, -0.24)$	$(-0.26, -0.13)$	$(-0.46, -0.39)$	
Present-day Change	-0.18^{***}	-0.06^{***}	-0.16^{***}	0.08^{***}	-0.11^{***}
	$(-0.25, -0.11)$	$(-0.09, -0.03)$	$(-0.22, -0.09)$	$(0.03, 0.12)$	$(-0.16, -0.05)$
Obs	8,158	8,158	10,307	10,307	8,158

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$
95% confidence intervals in parentheses based on tribe-clustered standard errors.

Table 6: Precipitation

	Dependent Variable: Mean Annual Precipitation				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Tribe FE
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	899.90***	994.95***	912.75***	934.07***	
	(835.36, 964.44)	(907.55, 1,082.34)	(860.36, 965.14)	(883.07, 985.07)	
Present-day Change	−14.02	57.62***	−4.61	135.06***	6.39
	(−91.12, 63.08)	(25.42, 89.83)	(−80.28, 71.07)	(73.79, 196.33)	(−35.63, 48.41)
Obs	8,137	8,137	10,271	10,271	8,137

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

Table 7: Wildfire Hazard Potential

	Dependent Variable: Mean Wildfire Hazard Potential				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Tribe FE
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	1.17***	1.73***	1.25***	1.93***	
	(1.02, 1.33)	(1.62, 1.84)	(1.11, 1.39)	(1.85, 2.02)	
Present-day Change	0.55***	0.02	0.47***	−0.16***	0.14***
	(0.41, 0.69)	(−0.05, 0.09)	(0.33, 0.61)	(−0.26, −0.07)	(0.04, 0.23)
Obs	8,158	8,158	10,307	10,307	8,158

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

likely to have access to subsurface oil and gas than the baseline historical lands (60% [0.53, 0.66]). Estimating OLS with a binary dependent variable is known as a linear probability model (LPM). The LPM has two well-known shortcomings: 1) bias when the mass of the distribution lies outside of the unit interval, and 2) heteroskedasticity. Since we estimate all models with robust standard errors, we correct for heteroskedasticity. We estimate a logistic regression (column 5) to assess the robustness of the difference between present-day and historical lands. The results of the logistic regression indicate that present-day lands have less access to oil and gas supporting the results of our main specification. The results are robust to weighting and the sample used. Although, we note that the estimates of the Full OLS model are not statistically significant.

4.7 Oil Production

We compare annual oil production (measured in thousands of barrels) between historical and present-day lands, with model specifications providing some evidence that there is less oil production on present-day CCEs (Table 9). While our primary OLS specification shows a statistically insignificant reduction in oil production (123 thousand barrels), additional model specifications show significant reductions. When the full dataset is included, the average oil production of present-day CCEs falls by 334 thousand barrels per year, a 50% reduction from the average across the historical CCEs (783 thousand barrels).

4.8 Gas Production

Drawing on the U.S. Department of Agriculture's natural gas production data (measured in million cubic feet), we compare gas production between historical and present-day lands. Our estimates indicate that gas production increased by 4.29 billion cubic feet per year in present-day CCEs up from 6.1 billion cubic feet on the historical CCEs (Table 10). However, these results do not seem to be robust across specifications. Additional model specification yield mixed results. The Weighted, Full Weighted OLS, and Tribe Fixed Effects models show insignificant changes in gas production between time periods.

4.9 Oil and Gas Wells

Utilizing U.S. Geological Survey data on well locations between 1859 - 2005, we evaluate differences in the total number of oil and gas wells between historical and present-day lands. Table 11 shows the results of the OLS model and indicates that present-day CCEs have 94.82 more wells than historical CCEs. We find additional evidence of this statistically significant relationship in the Full OLS and Tribe FE models. While the estimates in the weighted models are not statistically significant, the coefficients agree that present-day CCEs have more wells.

4.10 Federal Lands

Finally, we study the difference between proximity to public lands during the historical and present-day periods. We estimate two types of models on the two datasets. The first model is a Zero-Inflated Beta model designed to analyze data bounded by 0 and 1. The zero-inflated version of the model accounts for the over abundance of zeros (Table 2). The results suggest that present-day lands are closer to public lands compared to historical lands. The BEZI and Full BEZI coefficient estimates on Present-day Change is 0.506 and 0.519, which implies that the odds of being in proximity to public lands in the present-day period are 1.65 higher than in the historial period. The OLS estimates suggest that the present-day CCEs are about twice as likely to be near public lands. This larger effect is likely due to the mispecification of the model of the limited dependent variable.

Table 8: Oil and Gas Access

	Dependent Variable: Presence of Subsurface Oil and Gas				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Logit
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	0.60***	0.35***	0.57***	0.30***	0.39***
	(0.53, 0.66)	(0.28, 0.41)	(0.51, 0.63)	(0.25, 0.36)	(0.12, 0.66)
Present-day Change	−0.11**	0.03*	−0.07	0.09***	−0.43**
	(−0.20, −0.01)	(−0.005, 0.07)	(−0.16, 0.02)	(0.04, 0.15)	(−0.80, −0.06)
Obs	7,307	7,307	8,733	8,733	7,307

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

Table 9: Oil Production

	Dependent Variable: Oil Production (billions of barrels)				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Tribe FE
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	552.90***	687.44***	783.27***	2,137.19***	
	(351.61, 754.19)	(352.69, 1,022.19)	(544.16, 1,022.38)	(1,011.27, 3,263.11)	
Present-day Change	−123.40	−413.28**	−334.11***	−1,804.30***	−259.53*
	(−333.46, 86.66)	(−734.65, −91.90)	(−587.23, −80.99)	(−2,932.09, −676.50)	(−523.87, 4.80)
Obs	8,164	8,164	10,313	10,313	8,164

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

Table 10: Gas Production

	Dependent Variable: Gas Production (millions cubic feet)				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Tribe FE
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	6,083.83***	8,273.17***	5,270.33***	6,595.03***	
	(3,998.81, 8,168.85)	(2,395.39, 14,150.95)	(3,614.17, 6,926.49)	(3,425.19, 9,764.87)	
Present-day Change	4,294.30*	−577.66	5,235.96**	1,029.82	2,340.44
	(−804.67, 9,393.27)	(−4,228.87, 3,073.55)	(380.64, 10,091.29)	(−2,137.14, 4,196.79)	(−2,576.17, 7,257.06)
Obs	8,164	8,164	10,313	10,313	8,164

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

Table 11: Oil and Gas Wells

	Dependent Variable: Count of Oil and Gas Wells				
	OLS	Weighted OLS	Full OLS	Full Weighted OLS	Tribe FE
	(1)	(2)	(3)	(4)	(5)
Historical (Intercept)	293.34***	238.11***	263.49***	192.42***	
	(231.87, 354.82)	(173.53, 302.69)	(210.79, 316.19)	(144.52, 240.32)	
Present-day Change	94.82**	59.86*	141.38***	118.77***	105.69***
	(8.83, 180.81)	(−7.46, 127.18)	(55.84, 226.93)	(52.51, 185.04)	(38.21, 173.17)
Obs	7,307	7,307	8,733	8,733	7,307

Note: *p<0.1; **p<0.05; ***p<0.01
95% confidence intervals in parentheses based on tribe-clustered standard errors.

Table 12: Proximity to Public Lands

	Dependent Variable: Proximity to Public Lands			
	BEZI	Full BEZI	OLS	Full OLS
Historical (Intercept)	-1.539^{***}	-1.592^{***}	0.067^{***}	0.075^{***}
	$(-1.586;\ -1.492)$	$(-1.635;\ -1.549)$	$(0.051;\ 0.082)$	$(0.055;\ 0.094)$
Present-day Change	0.506^{***}	0.519^{***}	0.078^{***}	0.077^{***}
	$(0.388;\ 0.625)$	$(0.405;\ 0.633)$	$(0.045;\ 0.110)$	$(0.044;\ 0.110)$
Obs.	8165	10314	8165	10314

$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

5 References

Abatzoglou, J. T. (2013). Development of gridded surface meteorological data for ecological applications and modelling. International Journal of Climatology, 33(1), 121–131. https://doi.org/10.1002/joc.3413

Abatzoglou, J. T., & Williams, A. P. (2016). Impact of anthropogenic climate change on wildfire across western US forests. Proceedings of the National Academy of Sciences, 113(42), 11770–11775. https://doi.org/10.1073/pnas.1607171113

Dillon, Gregory K. 2018. Wildfire Hazard Potential (WHP) for the conterminous United States (270-m GRID), version 2018 classified. 2nd Edition. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2015-0046-2

Westerling, A. L., Hidalgo, H. G., Cayan, D. R., & Swetnam, T. W. (2006). Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity. Science, 313(5789), 940–943. https://doi.org/10.1126/science.1128834