Examining the Design and Use of the Pasture, Rangeland, Forage (PRF) Program

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Abstract

Drought represents one of the main risk factors in ranching in the Western United States. To assist in mitigating against the impacts of drought, the pasture, rangeland, and forage (PRF) insurance product was developed by the Risk Management Agency (RMA) and first offered in 2007 as a pilot product. Recent changes to PRF, including (1) increased availability, (2) changing the index from vegetative to rainfall in several states, and (3) updating the prices, have led to an increase in both acreage and participation since 2015. The number of insured acres has increased by 79.7 percent from 54.7 million acres in 2015 to 98.3 million acres[1] in 2018. The number of policies sold has also increased from 24,693 in 2015 to 32,761 in 2018, amounting to a 32.7 percent increase. Results demonstrate support for PRF loss ratios being close to RMA objectives, while policy selections have resulted in insured months not always aligning with months where rainfall is critical for forage production.

Introduction

Drought risk in rangeland production systems remains a key component of risk to ranchers across the Western United States and can result in production losses to forage, increased costs, higher than normal cattle mortality rates, reduced animal health, and decreased cattle weight gain. Recent examples of drought have demonstrated the devastating impacts that drought can have on livestock inventories and rancher balance sheets. For example, starting in the summer of 2011, the Southern High Plains region encompassing the region from Texas to Kansas to Utah and Arizona experienced a one-hundred-year drought. Sixty-four percent of all rangeland in Texas was rated "very poor" based on the National Agricultural Statistical Service (NASS) rating system, and detrended hay production fell by 57% from the prior year (Belasco and Rucker, 2018). This drought was followed by a dramatic 24% reduction in Texas cattle inventory from 2010 to 2014 (NASS Quickstats). While cattle inventories since have shown increases, Texas cattle inventories remain below pre-drought levels. As discussed in MacLachlan et al. (2018), the drought starting in 2012 was more widespread than just the Southern High Plains, as it also spread into the Midwest, Mountain West, West, and Southern regions. Droughts of this nature are pervasive throughout the United States and pose a constant threat to ranch production and income.

The two main components to profit variability in ranch operations include price risk and forage production risk, which can manifest itself as the ability of ranchers to feed their herd. While producers often mitigate price risk through well-established futures and options markets, forward contracts, and federal insurance products[2], weather risk is not often managed through privately offered forms of insurance. Regional droughts

1 Estimates for 2018 are preliminary at the time of this publication and will likely be revised.

2 The RMA currently offers Livestock Gross Margin (LGM) and Livestock Risk Protection (LRP), which allow cattle producers to insure against adverse price swings.

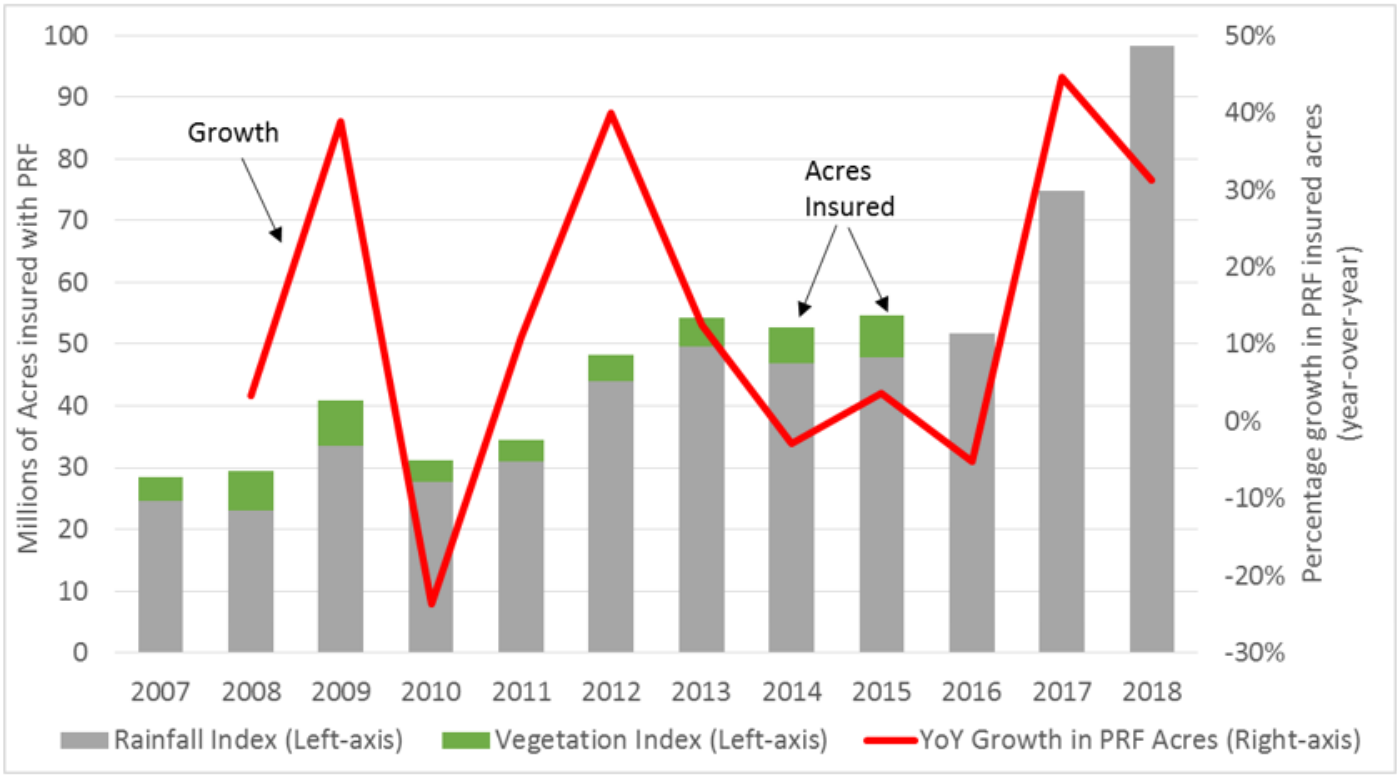

Figure 1. Acres insured under Pasture, Rangeland, Forage insurance and annual growth rates.
Source: Risk Management Agency, Summary of Business (2018)

provide incentives for ranchers to move their animals to feedlots at an earlier stage or rangeland that has available feed and rangelands. While these two strategies are common responses to drought, they often lead to short-run liquidation of cattle inventories and result in profit losses for multiple future years. This type of inventory adjustment may also be suboptimal for a stable food supply and increases the volatility of beef and cattle prices, given that the vast majority of beef consumed in the U.S. is produced domestically (USDA ERS Livestock and Meat Domestic Data). Programs like PRF are intended to provide indemnity payments in times of low rainfall and potentially low forage production periods. Those payments provide an important link for ranchers to manage increased feed costs during drought periods and may reduce the economic incentives to immediately liquidate cattle inventories.

Pasture, Rangeland, Forage Insurance

In an effort to alleviate the impact of drought conditions on cattle production, the pasture, rangeland, forage (PRF) insurance product was introduced as a pilot product by the Risk Management Agency (RMA) in 2007. The ongoing pilot status of PRF has provided flexibility in rerating and allows producers to simultaneously enroll in the Non-insured Crop Disaster Assistance Program (NAP).[3] However, if both programs are triggered, the producer can only accept an indemnity from one of the programs. In spite of growth in insured acreage over the life of the PRF, the program experienced an accelerated growth rate of forty-five percent in 2017 and an additional thirty-one percent in 2018, as is shown in figure 1. In 2018, the program insured 98 million acres with a total liability of $2.4 billion. While PRF comprises eleven percent of the total acres within the total RMA book of business[4], in 2017 it represented only 1.6 percent of RMA's total liability ($106 billion).

3 NAP is an insurance-like program offered by the Farm Service Agency that provides coverage against natural disasters, including yield or crop losses to producers without crop insurance available or only have a pilot crop insurance program available to them. Payments are limited to $125,000 per crop year, per individual or entity and can only be made to an individual or entity with an adjusted gross income less than $900,000.

4 In 2017, the RMA reported 679 million acres in total and 75 million acres enrolled in PRF.

	Acres Insured		
State	2015 Vegetative Index	2018 Rainfall Index	Increase
Arizona	563,021	24,083,669	23,459,203
Idaho	94,436	676,693	551,238
New Mexico	2,159,275	8,132,364	5,973,089
Nevada	1,773,473	7,941,283	6,167,810
Oregon	167,616	2,234,555	2,066,939
Utah	353,928	5,194,554	4,840,626
Wyoming	1,482,323	3,645,964	2,163,641
Total	6,594,072	51,909,082	45,315,010

Table 1. Insurance Acreage by States switching from Vegetative Index to Rainfall Index under PRF.
Source: Risk Management Agency, Summary of Business (2018)

Notably, this growth in PRF has occurred despite the more generous benefits provided under the Livestock Forage Disaster Program (LFP) and its expansion under the Agricultural Act of 2014 (2014 Farm Bill). LFP is a federal program that pays livestock producers for forage losses based on an index calculation from the U.S. Drought Monitor. The 2014 Farm Bill increased the payment rate for LFP and removed the requirement to purchase PRF or NAP to be eligible for LFP payments. However, unlike crop insurance products, LFP has a maximum payment of $125,000 and producers must have an adjusted gross income of less than $900,000 to be eligible. Over the 3 year period from 2015-2017, the LFP program has paid out a total of $1.18 billion in disaster aid payments (FSA, 2018). As a means of comparison, over the same period, PRF policies paid $621 million in indemnities and collected $400 million in farmer-paid premiums. This amounts to a net indemnity of $221 million paid to ranchers (RMA, 2018), which is 19% of total LFP payments.

Recent Changes to PRF Insurance

In 2016, PRF underwent several major changes[5], including an expansion to include all states in the continental United States. These changes resulted in triggering index in several states from the vegetative index to the rainfall index, and adjusting the prices used in the premium and indemnity calculations. The availability of PRF expanded to an additional 19 states, making PRF available to all states in the continental U.S. This expansion included Washington—the only western state without PRF available at the time.

PRF switched from a mix of some states using a rainfall index while others used a vegetation index for the indemnity payment trigger, to all states having the PRF policies triggered by the rainfall index. According to the RMA (2018), many producers had difficulty relating the vegetation index to their forage production. While the vegetation index is more highly correlated with the end of the season production, producers generally place greater importance on spring greening. The Normalized Difference Vegetation Index (NDVI), formerly used as the vegetation index to trigger PRF payments, measures photosynthesis not "greenness" of vegetation. Therefore, certain weather conditions can cause "good" measures of photosynthesis—hence not triggering the policy—yet the spring greening may not be a robust indicator of forage production. In the remote-sensing literature, the difference between NDVI, and "greenness"—measured as the Leaf Area Index (LAI)—has been well documented (Wang et al., 2005). Galvão et al. (2011) show that the Enhanced Vegetation Index[6] was found to measure solar illumination rather than LAI during periods of dryness.

Much of the total growth in acreage and participation experienced over the last three years originated in the states that have converted from a vegetative index to a rainfall index, as shown in table 1. For example,

5 The changes to PRF were announced in 2015 but were not effective until the 2016 crop year.

6 The Enhanced Vegetation Index is similar to NDVI in calculation but corrects for certain distortions caused by air particles (Weier and Herring, 2000).

Table 2. Pasture, Rangeland and Forage Summary of Business for 2017.

Coverage Level	Acres Insured (In millions of Acres)	Average Acreage per Policy	Premium Subsidy	Loss Ratio	Farmer Loss Ratio
70%	1.52	1,427	59%	1.14	2.79
75%	17.38	7,316	59%	0.69	1.69
80%	0.91	1,448	55%	0.99	2.21
85%	25.30	4,009	55%	0.91	2.02
90%	29.83	1,648	51%	0.94	1.91
Total	74.93	2,632	-	0.90	1.92

Source: Risk Management Agency, Summary of Business (2018), accessed October 2018.

Note: Loss ratio is defined as indemnities divided by total premium. Farmer loss ratio is defined as indemnities divided by farmer-paid premiums (total premium – subsidies).

acreage in Arizona increased by 23.5 million acres from 2015 to 2018. As shown in table 1, insured acreage in these seven states increased by 45.3 million acres, while the program experienced a total increase of 43.6 million acres over the same period.

Additional changes were made to the grazing pricing methodology after ranchers reported that the prices for grazing used for the PRF policies were too low. The rerating of the pricing methodology was intended to better cover the cost of feed alternatives. Now RMA uses the "Animal Unit Month" by county, hay prices, stocking rates, and available forage to determine the value of grazing used in the PRF policies. The new method generally raises the cost of the policies for grazing. The program had another recent change in the rating, albeit minor, with the county base value changing from a state level price to a sub-state level price for all states for the 2018 crop year and the following years.

Prior to the 2016 rerating, RMA did not distinguish between irrigated and non-irrigated haying, and now insurance coverage for separate irrigated and non-irrigated haying practices are available in several states. While producers with irrigated hay do not experience the same loss of production during low rainfall as those with non-irrigated hay, RMA accounts for the additional cost of irrigation during periods of below-average rainfall in PRF (Risk Management Agency, 2018).

Recent Historical Performance of PRF Insurance

In 2017, approximately 75 million acres were insured under PRF and summarized in table 2. Of those acres, 74% (55 million acres) were insured under the highest two coverage levels of 85% and 90%. Additionally, 25% of acres (17 million acres) were insured under the 75% percent coverage level, which also comes with the highest subsidy rate for buy-up coverage (equal to the premium subsidy rate for 70% coverage). Despite 90% being the coverage level with the most total acres, this coverage level had an average acreage per policy of 1,648, which is low relative to the average across all policies (2,631 acres per policy). Loss ratios, which are calculated as indemnities divided by total premium (including subsidies), are 0.91 and 0.94 for the highest coverage levels. The policy-wide loss ratio from 2015-2017 was 0.90, which is relatively close to the RMA targeted loss ratio of 1.0.[7] This results in farmer-paid loss ratios of 2.02 and 1.91 for 85% and 90%, respectively. Farmer-paid loss ratios provide the average indemnity received for every $1 paid in premium by the farmer. This implies that for the 85% coverage level, ranchers received an average of $2.02 in indemnity payments for every $1 in farmer-paid premiums. While this return might make PRF sound like an appealing insurance product, it also comes with a substantial up-front premium cost, particularly for larger ranches. For example, a 3,000 acre

7 The RMA is mandated to set rates that cover anticipated losses and a reasonable reserve, where the current disaster reserve factor is 0.88 (Coble et al., 2010). The targeted loss ratio, which was lowered from 1.075 as part of the 2008 farm bill, is currently 1.0.

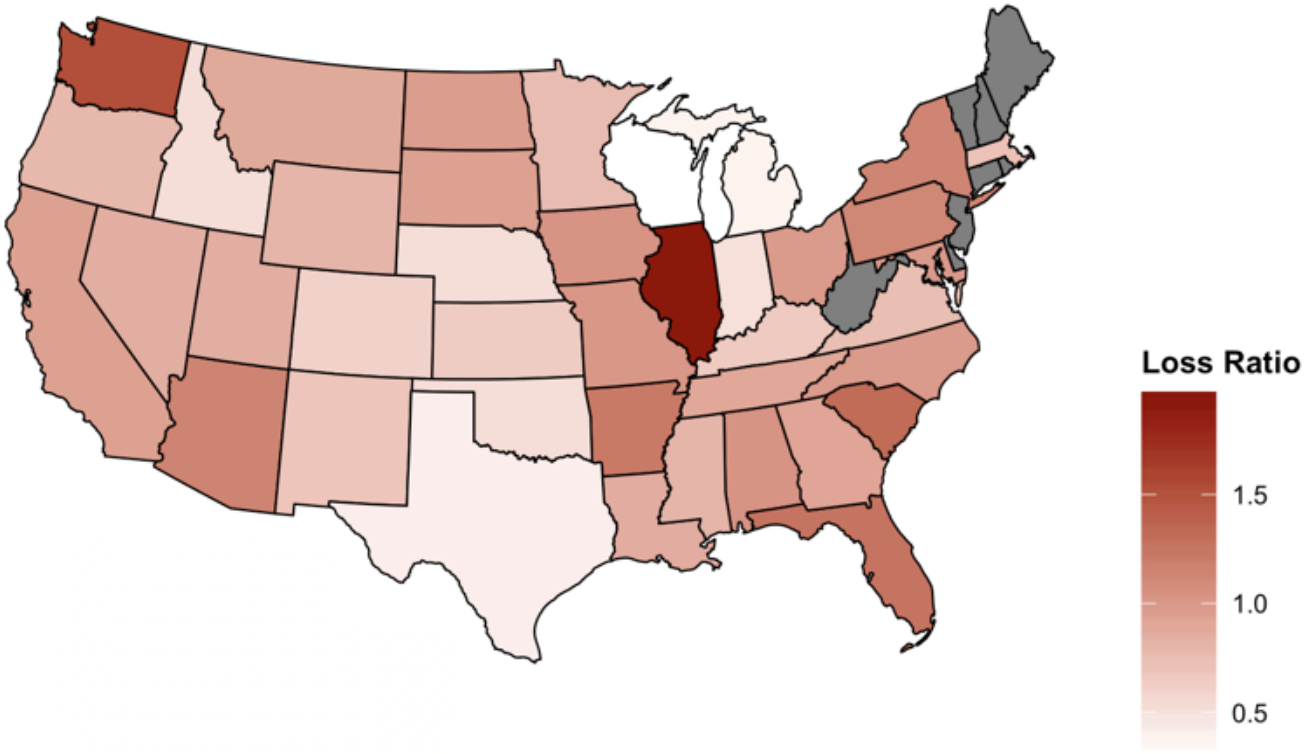

Figure 2. Map of state-level average loss ratios, 2015-2017.
Source: Risk Management Agency, Summary of Business (2018)
Note: Gray indicates no data reported in RMA Summary of Business database for PRF

ranch would pay $7,410 in farmer-paid premium costs, assuming the national average farmer-paid premium per acre in 2017 of $2.37[8] for PRF.

Figure 2 shows a map of state-level average loss ratios for the period 2015-2017. For much of the Central Plains and Western United States loss ratios were relatively low, indicating comparatively low indemnity payments relative to premium payments. Washington is the one notable exception to these low loss ratios with an average loss ratio of 1.52, which mostly came from payments made in 2017, where only 44 policies were sold covering 297,215 acres. Additionally, higher than normal loss ratios can be found in the Southern region, where droughts were also experienced in 2017. Given the high degree of spatial correlation of drought conditions, large shocks to loss ratios are found to occur in response to such events.

PRF is different from most other crop insurance products due to its year-round nature which allows for the selection of two-month time intervals throughout the year. Selections for each policy must include at least two intervals and intervals cannot contain adjacent months. For example, a producer cannot select the intervals May-June and June-July. The selection of intervals, allocation across intervals, productivity factor, and coverage level, provides a multi-dimensional decision for each PRF insurance policy. Figure 3 demonstrates the percent covered under each time interval in the Mountain West region and uses the average allocations for 2015-2017. In most states, producer selections of time intervals are spread fairly evenly throughout the year, in spite of rainfall during spring and early summer being the most critical to grass growth in this region (National

8 The national average farmer-paid premium per acre for PRF in 2017 was computed by dividing the total farmer-paid premiums ($177.353 million) by the number of acres enrolled in PRF (74.917 million acres), as reported by the RMA (2018).

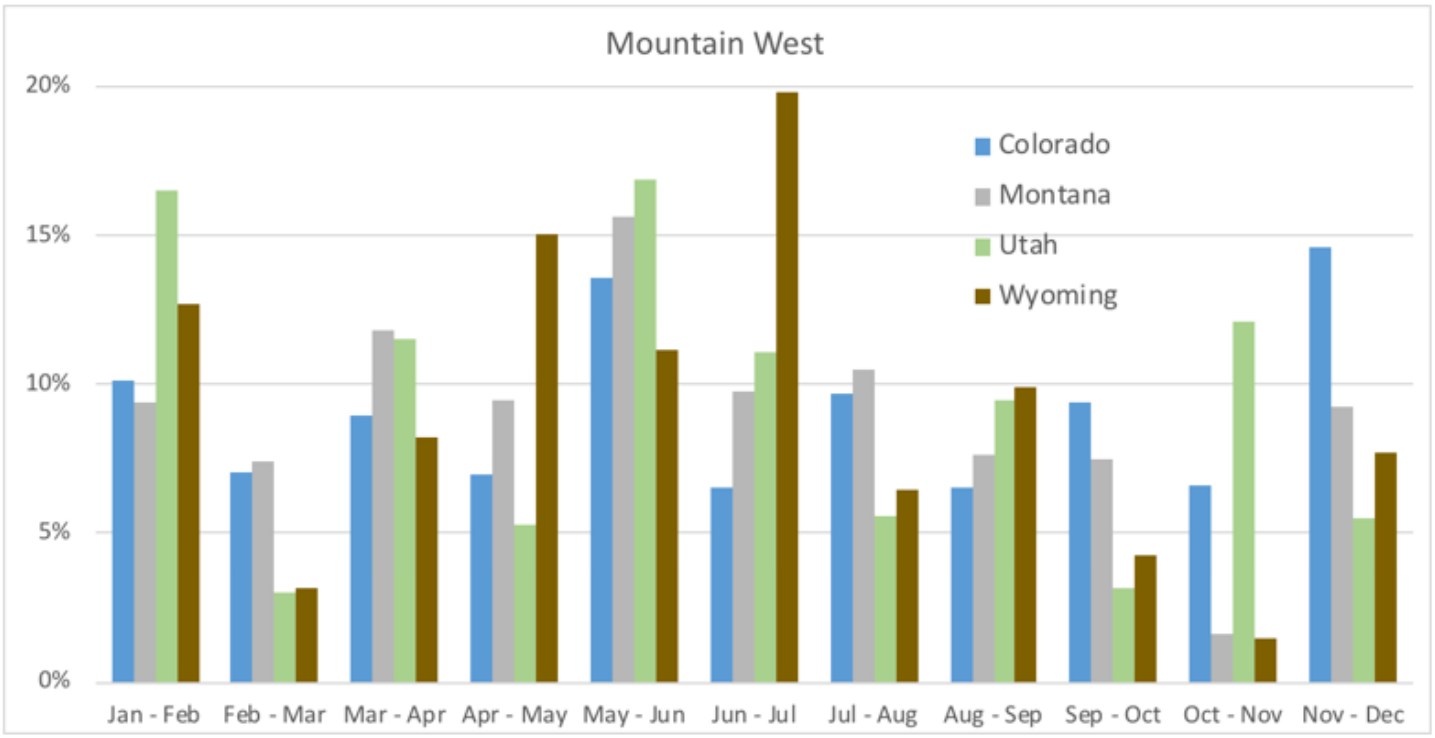

Figure 3. Mountain West Region State-wide Average Percentage of Time Interval Selections for Pasture, Rangeland, and Forage Insurance, 2015-2017
Note: Figures include rainfall index coverage only.
Source: Risk Management Agency,, Summary of Business (2018)

Drought Mitigation Center, 2018). Interestingly, many producers choose to insure during the winter months despite little evidence that forage production is impacted by snowpack (Frank, 1973).

Westerhold et al. (2018) use data from two Nebraska ranches to evaluate the effectiveness of insuring in different months and find conflicting strategies for selecting months when ranchers are basing their decisions on expected income maximization or risk minimization. The presence of conflicting strategies may come from variations in either utility preferences or advice from crop insurance agents. While ranchers participating in PRF are certainly not excluded from utilizing a strategy of expected income maximization, the main objective of many RMA products is likely to provide producers with opportunities to minimize market risks. This conflict in marketing strategies is not likely to be present in other crop insurance applications where risk minimization and income maximization tend to lead to a consistent strategy.

Discussion

With drought as a prominent source of risk for rangeland management, many producers have turned to PRF for financial protection. Changes in the PRF policy design and availability have led to a surge in enrollment over the last three years, yet there are still lingering questions on the optimal interval selection. Rainfall index insurance for forage has not only gained producers' attention in the Western U.S. but policymakers' as well. The House draft of the 2018 Farm Bill includes language to allow producers to purchase annual forage insurance —a rainfall index insurance product similar to PRF—for winter wheat grazing even if the producer purchases a crop insurance policy for the harvested crop. Currently, the purchase of two policies for the same production is prohibited. The interests of both producers and policymakers highlight the gravity of stabilizing ranchers' income when confronted with drought.

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