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Cheatgrass in the Basin and Range: Threat and Opportunity

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1. Introduction

Ranchers, rural communities, and those interested in agricultural production and the incidence of wildfires and other threats in the Basin and Range Region have little analysis to support issues with the Bureau of Land Management (BLM) or other federal and state agencies that fashion regulations and policies. These citizens and groups simply lack significant input for full participation in decisions about regulations and policies. The result is that the many constituents that have a stake in the policies and regulations of federal and state lands are not a factor in important decisions about grazing, wildfires, wildlife habit and other major decisions about their livelihoods (Johnson 2016; Abatzoglou and Kolden 2011; Balch 2013;Clemets and Harmon 2018; Young et al. 1987).

This paper is will provide those constituents without systematic information about the rangeland issues mentioned above with information that can give them a substantive role as stakeholders. Examples of the issues that could benefit from the valuable input of citizens and communities that are left out of policy and regulatory decisions include, differences between grazing of perennials and invasive species, wildfire management and control, grazing after wildfires, active ranching versus allocations to wilderness, and other timely regulatory and policy matters.

One of the cardinal features of public policy and regulatory decisions is full inclusion of stakeholders. Where the federal and state governments control large areas of public lands there is reason to provide stakeholders with information that can support an informed voice in major decisions. This paper provides results that can support a stronger basis for input of citizens groups and private and public agencies in the decisions on range management. We wish to stress that the analysis is preliminary, and much of it is dependent on previously available but uncollated scientific reports. For example, the costs, returns and net revenue budgets from the land grant universities, cattle numbers that can be used along with the budgets to provide estimates for counties and community economic models. As well, the scoring analysis is used for purposes of providing a county level assessment of restoration to traditional grazing.

The focus of this analysis is two-fold:

--cattle number decreases in the Basin and Range Region during recent years and

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--the current concern about cheatgrass grazing and potential for fall term grazing by cattle?

Of course, other regulatory issues that deserve input by the broad set of stakeholders like spaying and other management approaches for managing cheatgrass are not the subject of this paper. The analysis we will concentrate on only the above two questions, although the background prepared for this analysis can be applied for a number of related rang land concerns.

2. Objectives

It is high time that all of the participants in decisions about the rangeland and landscape in the Basin and Range Region have an opportunity to provide input into the decisions that are now handed down from the federal agencies and in fact, selected state agencies as well. The specific objectives of this research for the Basin and Range Region are:

-- to generate complete costs, returns and net revenue information (budgets) for all counties,

--to obtain cattle numbers (beef cows) that can be included with the costs, returns and net revenue estimates for counties,

--to estimate economic impacts of cattle grazing for communities and states, and

--to estimate the incidence wildfires in one county.

We emphasize that these sets of calculations will be necessary for most other and landscape investigations of grazing conditions in the Range and Basin Region.

3. Budgets for Cattle Grazing, in the Basin and Range Region

Two sets of budgets were prepared that include all counties in the Basin and Range Region (with California and Colorado omitted). These budgets were for 2016; and for the average of the years 2014, 2015 and 2016. In the Basin and Range Region, there were 139 counties required for inclusion in the budgets or costs, returns and net returns. Some of the budgets are for specific counties and some collections of counties. Again, we used the budgets prepared by land grant institutions in each state to define the specific counties or collections of counties for application of the budget estimates. We used the three-year averages as per agreement from our Budget Committee that indicated the year 2016 was an off year for cattle production and sales due to both low prices and low cattle numbers (see Appendix A included in the UCED web page, for the listing of members).

The counties contained in the Basin and Rage Region for each state are in Appendix B (again listed in the UCED web page for data graphic and listed form). Note that there are tables and/or figures for each state, Washington, Idaho, Montana, Wyoming, Utah, Oregon, Nevada, New Mexico and Arizona. California and Colorado have some counties in the Basin and Range Region but did not have available budgets. Colorado had only a stocker budget and California did not have available budgets for counties or portions of counties in the Basin and Range Region. Thus, in this analysis we omitted these states and counties from the calculations of variable costs, returns and net returns. The counties in the omitted states could be included, if budgets were available and/or we could use the budgets from bordering states for these calculations.

A major problem in developing the budgets was the fact that the land grant universities in the region had not kept up with the changing times. Because most of the budgets were not for 2014, 2015, and 2016, they needed updating to reflect the years for analysis. The process that we used for updating that involved several sets of available numbers, including State Agricultural Statistics, the UDSA National Agricultural Statistics and Prices Paid by Ranchers (state data), and Bureau of Labor Price Indices. We in fact, used a combination of these data series to update the budgets. For the prices of cattle we used the USDA reported Commodity Returns from Cow-Calf Operations in the Basin and Range Region, and for hay and other cost requirements--we used the Prices Paid from each state and other Price Indices available from the Bureau of Labor Statistics.

The budgets for 2014–2016 are in Appendix C and the budgets for the year 2016 alone are in Appendix D (Again available on the UCED web site). Note that the numbers at the top of the budget pages provide information on the year (or years) when the budgets were actually prepared by the state land grant universities. Again, some these budgets are for at least 10 years older than for the years selected for the analysis. Also, note again that the updated budgets were prepared only for variable costs and returns. We decided to leave the long term "fixed" costs out of the budget analysis because they do not reflect the short-term annual decisions made by ranchers for production.

Reviewing the budgets across states, we found that the basic technologies were more or less the same for cow-calf or cattle production. The primary differences in bred cow costs, returns and net returns were due to efficiencies gained from scale of operation, growth conditions reflecting forage and climate, and the proportion of feed supplied when grazing was not available on public lands. Revenues per bred cows and calves for 2014-2016 range between $540 and $1,253 across the region and variable costs ranged from $147 to $1,106. The variable cost estimates that stick out are for the counties and collections of counties in the states of Arizona on the low side and Oregon on the high side. The lowest overall revenues were for Arizona, with the highest in the state of Washington, but Idaho and Montana also yielded higher than average costs and revenues per cow.

4. NASS Cattle Numbers

The USDA National Agricultural Statistics Service (NASS) supplies "beef cow" inventories for each county within the Basin and Range Region (and the nation). These "estimates" however require some qualification. The actual numbers are available for each county during the Census, were necessary cow numbers had to be interpolated for non-Census years. For counties with large beef cow numbers were directly available from NASS (not on an interpolated basis). With this qualification, the numbers were used and available for all of the counties in the Range and Basis Region. For the three-year budgets presented, the beef cow numbers for counties had to be averaged. These county 3-year average budgets are in Appendix E (Again available from UCED web site). We felt that the estimates for a three-year period would be better for use than 2016 numbers alone for the development of beef cow costs and returns for the Basin and Range Region.

The beef cow numbers however require added explanations. Beef cows for the year lead to cow calf production. These calf numbers are adjusted by NASS, and as well, the NASS numbers account for replacements and or the culling of beef cows. See the NASS annual county data for an explanation. .

The beef cows are grazed on range land mostly after calving, and the calves are sold at 400+ pounds live weight. This sale of calves is the major source of revenue for the beef cow growers, even when culled cows are included. These beef cow numbers are the ones for use for evaluating costs, returns and net returns for the cattle operations in counties.

With the three-year beef cow inventories, the budgets can be used to compute total variable costs, returns and net returns for each county and state in the Basin and Range Region. Appendix F (Again from UCED web site) contains the results for the budgeted counties, states and region. Table 1 provides state estimates for sets of counties (or single counties) states and the Basin and Range Region.

From Table 1, the total net variable returns (variable returns less variable costs) for the Basin and Range Region for the average the period 2014-2016 was 1,202,220,000 or about 1.20 billion dollars. This totals distributed by state for BLM lands (which are often only a part of the cattle statistics) are shown also in Table 1. Montana had the highest beef cow inventories (767,245) followed by Utah and Oregon at approximately 329,117 and 329,667, respectively. In county or collections of counties, the largest beef cow numbers were in Elk County, Nevada, Klamath/lake Counties Oregon and Southwest New Mexico, all in the neighbor of 72,000 plus. Smaller numbers of beef cows on range land were mostly in the Nevada counties. More county estimates are in Appendix Table F (Again available from the UCED web site) and specified on the multi county levels in Table 1.

Table 1. Total Revenues, Variable Costs, and Returns

	Beef Cow Inventory	Total Revenue	Total Costs	Returns
		Thousand dollars		
Arizona				
Plateau Region	35,106	$21,987	$9,828	$12,158
SW Desert Region	40,710	$21,998	$5,983	$16,014
Strip Region	13,498	$8,302	$6,654	$1,648
Western Desert Region	50,542	$27,436	$10,671	$16,765
Arizona Basin & Range	139,856	$79,722	$33,136	$46,586
Idaho				
Northern Idaho	42,294	$49,414	$29,848	$19,566
Magic Valley	94,333	$97,512	$47,749	$49,762
Eastern Idaho	142,784	$166,774	$89,139	$77,634
Idaho Basin & Range	279,411	$313,699	$166,737	$146,963
Montana				
Montana Basin & Range	767,245	$868,834	$362,476	$506,359
New Mexico				
Northwest New Mexico	37,833	$30,396	$12,930	$17,466
Central New Mexico	44,633	$35,064	$13,852	$21,212
Southwest New Mexico	79,491	$59,336	$23,268	$36,068
New Mexico Basin & Range	161,957	$124,797	$50,061	$74,736
Nevada				
Douglas County	5,653	$5,168	$3,376	$1,792
Elko County	72,214	$67,710	$37,187	$30,523
Eureka County	11,907	$11,945	$6,892	$5,053
Humboldt Couunty	36,597	$35,901	$22,763	$13,137
Lyon County	11,453	$10,695	$7,224	$3,471
Pershing County	11,887	$11,621	$6,841	$4,780
White Pine County	15,561	$17,382	$10,768	$6,614
Other Nevada Basin & Rang	57,763	$56,068	$33,221	$22,847
Nevada Basin & Range	223,035	$216,488	$128,272	$88,216
Oregon				
Klamath/Lake Counties	73,833	$79,915	$69,810	$10,105
North Central Plateau	48,652	$44,319	$30,889	$13,431
High Desert Area	197,532	$174,004	$156,164	$17,840
Oregon Basin & Range	320,017	$298,238	$256,862	$41,376
Utah				
Box Elder County	33,500	$32,409	$18,950	$13,458
Duchesne County	25,000	$26,371	$10,966	$15,405
Tooele County	13,767	$13,711	$4,996	$8,715
Rich County	29,500	$28,622	$11,781	$16,841
Utah Other Basin & Range C	227,900	$226,805	$104,566	$122,239
Utah Basin & Range	329,667	$327,917	$151,259	$176,658
Washington				
Washington Basin & Range	49,579	$62,113	$24,611	$37,502
Wyoming				
Wyoming Basin & Range	49,579	$299,424	$215,599	$83,824
Total Basin & Range	2,320,346	$2,591,233	$1,389,012	$1,202,220

Clearly, the beef cow numbers for grazing on the public lands could increase, if cheatgrass and other invasives were included in the BLM calculations for authorized grazing numbers. Cheatgrass grazing is not a part of the calculations for BLM lands in the Basin and Range Region. If authorized by the BLM, the numbers of beef cows grazed could be increased by roughly the amount of available land estimated to reflect cheatgrass cover (in the longer run). The increase in beef cow numbers and the grazing of cheatgrass, in association with appropriate post-grazing vegetation restoration prescriptions could also lead to increases in wildlife in the Basin and Range Region. How much of the cheatgrass that is potentially available will be estimated in the application of the wildfire calculations for Elko County in the section below. This is a cheatgrass issue is real question for the BLM land management. How much can we reduce the incidence of wildfire in the Basin and Range Region, if beef cow numbers are increased and cheatgrass grazing allowed?

5. Results of Input Output Analysis

The Input output analysis was prepared only a selected county in Nevada, Elko, and the State of Nevada. This was because the input output models were not available for other states in the Basin and Range Region. We calculated economic benefits for the input output models to find the value of cattle grazing for the State of Nevada. Here the economic benefits are much smaller than for Elko County, which is largely agricultural were also estimated. We also the calculation of implications for increased cattle grazing using 1982 Census estimates for Elko County. The decrease cattle grazing for Elko County between 1982 and the average of 2014 – 2018 is about a 30 percent. This calculation has major implications for Elko County economic imact and for the possibility for increasing cattle numbers for the grazing of cheatgrass and wildlife habit.

A review of the IMPLAN model

To calculate economic impacts uses an input-output framework (Coupal and Holland 1995 and Willis and Holland 1996). Input-output analysis uses a transaction matrix to show how outputs from one industry become inputs for another. The columns of the input output matrix represent purchases made by each industry and the rows represent sales made by each industry. This framework facilitates tracing of supply chains between industries by calculating proportions of industry sales and purchases to each industry represented in the input-output matrix.

The analysis used the software, IMPLAN, which automates the input-output method. IMPLAN defines industries using a ”proprietary classification system” that separates industries into 536 categories and assigns each an industry code numbered, 1 through 536. In general, IMPLAN industry codes correspond to those defined by the North American Industry Classification System (NAICS) at varying levels of specificity. Beef cattle ranches fit under the IMPLAN industry code 11, "Beef cattle ranching and farming, including feedlots and dual-purpose ranching and farming", which was used to calculate the economic impact for the region.

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Results

Nevada has seen a decline in the number of cattle over the last few decades. In 1982, there were 359,000 beef cattle in the state, whereas today and averaging over the years of 2014 to 2016; the number of cattle in Nevada has decreased 223,035. Elko County has by far the greatest portion of cattle ranches in the state of Nevada. The County has seen a decline from 101,578 head in 1982 to 72,214 head that is and average of 2014 to 2016 numbers

Tables 2 shows the current impacts of cattle numbers in Elko County. Table 3 shows the hypothetical impacts of beef cattle, if the number of cattle in the County returned to the numbers of 1982. The difference in impacts in Tables 2 and 3 represent an increase of 29,364 cattle in the Elko County.

Table 2: Elko County 2016 with 2014-2016 Average Number of Cattle

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	188.9	5,990,868	8,802,269	67,709,764
Indirect Effect	259.6	14,673,361	11,063,141	20,883,959
Induced Effect	55.6	2,101,932	3,789,814	6,187,388
Total Effect	504.1	22,766,161	23,655,225	94,781,110

Table 3. Elko County with 1982 Number of Cattle

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	265.7	8,426,904	12,381,490	95,242,230
Indirect Effect	365.1	20,639,910	15,561,687	29,375,890
Induced Effect	78.2	2,956,630	5,330,846	8,703,332
Total Effect	709.1	32,023,444	33,274,023	133,321,452

According to the analysis, the current lower number of cattle is associated with approximately 200 fewer jobs in Elko County; $10 million less labor income, $10 million less GDP, and $40 million lower value of output.

Tables 4 and 5 present the Impacts of cattle numbers for the entire state of Nevada. Table 4 presets the direct and related effects. The differences in the impacts are presented in Tables 4 and 5 represent an increase of 135,965 cattle in the state.

Table 4: Nevada 2016 with 2014-2016 Average Number of Cattle

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	683.4	20,919,990	28,143,504	216,488,489
Indirect Effect	2,140.7	49,867,855	113,240,047	198,604,918
Induced Effect	305.7	12,055,132	23,464,118	37,509,411
Total Effect	3,129.9	82,842,977	164,847,668	452,602,818

Table 5: Nevada 2016 with 1982 Number of Cattle

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	1,100.1	33,673,085	45,300,145	348,462,652
Indirect Effect	3,445.8	80,267,937	182,272,628	319,677,015
Induced Effect	492.1	19,404,095	37,768,144	60,375,628
Total Effect	5,038.0	133,345,117	265,340,917	728,515,295

The analysis shows that the current lower number of cattle is associated with approximately 1,900 fewer jobs in Nevada, $51 million less labor income, $100 million less GDP, and numbers for comparison, $276 less value of output.

Taken together, the rest of the counties in addition to Elko County would have approximately 1,700 fewer jobs, $41 million less labor income, $90 million less GDP, and $236 million lower value of output due to the smaller number of cattle between 1982 and the average of 2014 – 2016.

These results show two things: First, the difference between county and state level evaluations is sharp. Rural counties have much greater economic impact of cattle grazing than for the entire state. . Secondly, the results show bias implied by taking only state level information for evaluating the impacts of grazing of cattle. Different states would provide different estimates of differences in cattle numbers and their impact on county and state level economic performance.

6. The Benefits of Reduced Wildfire Return Intervals from Grazing Cheatgass

Figure 1 shows the impact of cheatgrass for the Basin and Range Region. As graphically shown, the Wyoming Sagebrush is prevalent in Northern Nevada and the states adjacent (Taylor et al. 2013). Since it is dominated by cheatgrass, Elko County, Nevada is an appropriate place to investigate alternatives for the grazing of cheatgrass.

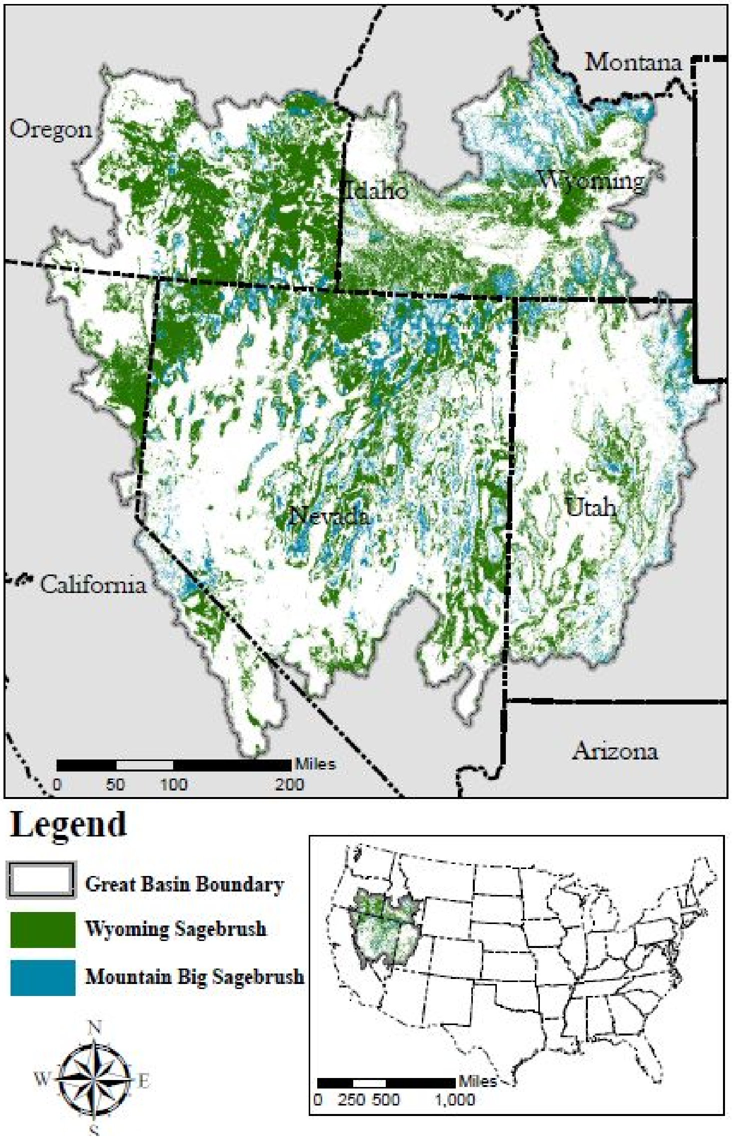

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Figure 3. Geographic Distribution of Wyoming Sagebrush Steppe (WSS) Plant Communities in the Great Basin. (Reproduced from Taylor et al. (2013).)

This analysis will use the work of Taylor et al (2013) to investigate the cheatgrass grazing in Elko County. Using grazing prescriptions that include an estimated 80 days of fall cheatgrass grazing not only has environmental benefits, but also relates to costs and profitability of cattle ranches. The fall grazing season starts after the frost in early October and continues until mid-December. We use 80 days because the grazing of cheatgrass requires about 80 days to consume one ton of cheatgrass. Twenty-five pounds per day at 80 days yields one ton of cheatgrass. Thus for calculating the tons of cheatgrass consumed, we can directly use the cattle number for the conversion.

Substituting 80 days of grazing for the October through December grazing eliminates the much more costly winter-feeding of hay and grain and can add a significant amounts to ranchers' bottom lines. We initially used the Elko County 700 cow-calf operation 2014-2016 average budget to estimate such impacts. We have made a number of simplifying assumptions for this exercise. Thus, the result is an example. Assumptions include:

1. The original grazing season is six months and would be expanded it by 80 days,
2. The original winter feeding period is six months is reduced by 80 days,
3. There is adequate cheatgrass area for all cattle during the expanded grazing season.
4. We adjusted variable costs by including a protein ration to one pound per day during the extended grazing season, but with transportation and labor costs not modified. (We realize that these might imply a difference, but estimates would require meetings with rancher panels to verify.)
5. Adequate nutrition during the extended grazing system and animal weights and condition are not affected.

Figure 5 illustrates the estimated difference between the traditional grazing schedule and one that includes an extended period of cheatgrass grazing. Grazing fees per cow would increase approximately $5, nearly four times the $1.35 per AUM. Our assumption is that all cattle utilize extended grazing, and are included in the per cow averages.

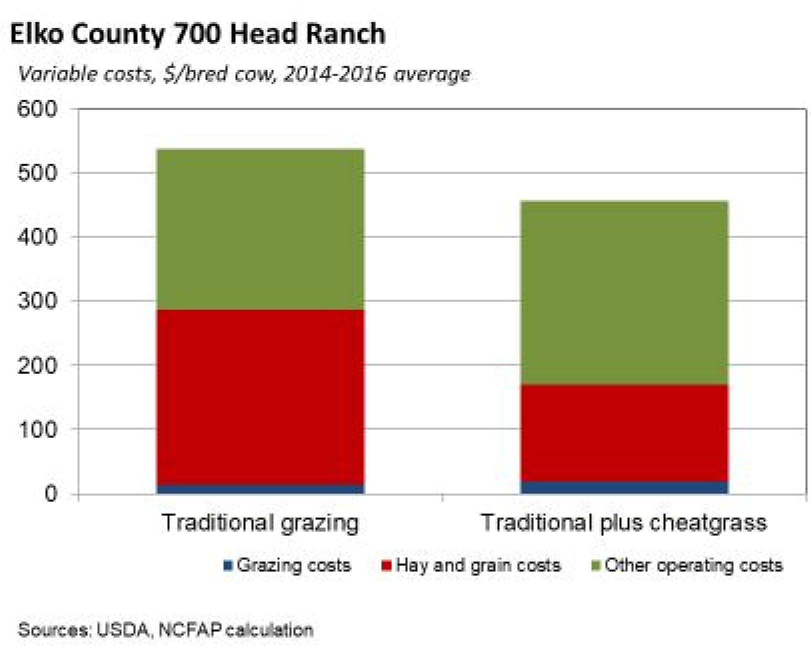

Figure 5. Comparison of Costs and Net Returns from Traditional and Extended Grazing

For the 700-cow ranch, this translates into approximately $57,000 higher net returns using budgets for the 2014-2016 average period. If adequate cheatgrass exists in the appropriate locations that all ranchers in Elko County could utilize the extended grazing period, the County impacts could be as much as $5.7 million. However, we must not assume that this would be a persistent possibility. Reducing the cheatgrass load in areas that could subsequently move to improved vegetation stages would eventually eliminate much of the cheatgrass. On the other hand, there could also be an increase in native species and expanded grazing areas that could accommodate higher numbers of cattle during traditional grazing seasons. Such decisions on grazing allotments and permits would ultimately be the purview of the BLM and Forest Service.

In addition, the removal of cheatgrass has implications for fuel reduction. Cattle grazing cheatgrass will consume from 20 to 25 pounds per day for the fall months. We select 25 pounds as the figure because the cattle are rather mature during the fall season. At the upper limit of 25 pounds times 80 days, this cheatgrass consumption level equals 2,000 pounds per head for the fall season. Multiplying this number times the approximate number of cattle available for fall grazing which is approximately 70,000 in Elko County equals an estimated 1.4 million pounds of cheatgrass consumed during the fall 80 days. A natural comparison would be to relate this number to the annual growth of cheatgrass in Elko County, which would give a number that would help the BLM evaluate the impact of cattle fall grazing for total cheatgrass management.

A process for cheatgrass reduction through an extended grazing period, consistent with the case study by. (Schmelzer et al, 2014; Svejcar and Perryman 2014). It follows that the:

First, cheatgrass will be removed from a designated range area through fall grazing. This will likely take at least two years to accomplish (Schmelzer, et al. 2014). Specifically, the standing biomass, including the annual growth of cheatgrass, and thatch is eliminated through livestock, leaving the ground with little or no cover, less than 100 pounds per acre.

Second, during the first two years, cattle can be allocated to the cheatgrass infested range in numbers that assure the full removal of cheatgrass—at about a consumption level of one ton per cow. However, the period required to remove all cheatgrass could be more or less than two years, depending on cheatgrass stand density and the percent of the existing biomass actually grazed per year.

Table 6 presents the grazing acreage required under densities and the number of years taken for full removal.

Table 6. Annual Acres of Cheatgrass Grazed by 1,000 Head

	Years for full removal			
	1	2	3	4
Lbs/acre	acres			
2,000	1,000	2,000	3,000	4,000
1,000	2,000	4,000	6,000	8,000
500	4,000	8,000	12,000	16,000

Third, the full consumption of cheatgrass will not assure that the cheatgrass will not return during the next year. It will germinate from the "seed bank" that is left from the previous year. Even annual growth levels of 100 pounds per acre will produce far more seed than is necessary to fully re populate cheatgrass. The annual growth of cheatgrass will have to again be consumed by cattle, but this time only the annual growth—approximated at about 100 pounds per acre.

Fourth, following initial cheatgrass removal in the first two years the range would again support traditional vegetation, with transition to native perennial grasses and proceeding to forbs and other perennial plants. That is, the range would be returned to native vegetation and be available for inclusion in managed grazing land, allowing increased cattle numbers.

Fifth, since after the second year cheatgrass is only consumed from annual growth, cattle can be extended to other infested range, allowing reclamation of other tracts. However, continued fall grazing will be required for long-term control of cheatgrass, even with a return of traditional grazing periods on the land.

Sixth, this process takes a number of years, but it can yield additional healthy range for cattle grazing. Cattle numbers can increase to previous peak numbers, if fall cheatgrass grazing is carried out in the long run by a significant number of ranchers in Elko County.

Cheatgrass" thatch" left from earlier years is a good medium for the germination of annual cheatgrass. With thatch consumed by cattle in the fall, the rate of germination will decrease. That is, fewer plants will germinate the following year, due to greater exposure to weather conditions. Specifically, cheatgrass that germinates without the cover of thatch is often not successful due to wind and other environmental conditions. Depending on conclusive evidence of germination of cheatgrass in thatch, this factor may be a major contributing to cheatgrass control, due to lower germination in the spring when the growing season for cheatgrass commences.

There is also the issue of rainfall feeding cheatgrass versus traditional plants in the range. With the removal of thatch form past cheatgrass growth, the annual rainfall goes directly into the ground. This has major implications for the growth of bunch grass and other natural grasses and for perennials--the beginning of the restoration of range to its traditional condition. Of course, there is much to be learned from this difference between rain entering the ground versus thatch, but this difference can initiate the transformation to traditional cover.

There are of course limitations to this fall cattle grazing strategy which are problematic in some cheatgrass infested areas. There must be adequate water in the proximity of the protein supplement to make both readily accessible to the herd. As well, there is the commitment of ranch hands to the change locations of cattle for full implementations of fall grazing. One of the reasons for the fall grazing is that the cattle do not stray far from the protein feeder that dispenses the nutrients that supplement the carbohydrates in the cheatgrass. Cattle will not go much more than 300 yards from the protein feeder and water, making it possible to graze the cattle with limited ranch hand supervision. What is required is to pull the feeder along as cheatgrass is consumed.

Finally, there is some amount of grazing of perennials during the fall grazing season. If the grazing of cheatgrass is in areas that have near 100 percent infestation, there is not much grazing of perennials. However, if the cheatgrass is with perennials there will be some grazing of perennials. Some estimates of the grazing of perennials put the level at about 20 percent. This is not problematic for the perennials since they are in a dormant state during the fall season after a hard frost.

8. Conclusions and Implications

This paper dealt with cheatgrass and cattle numbers in the Basin and Range Region. We showed that these two are related-- fall grazing of cheatgrass can lead to increases in cattle numbers in subsequent years. We also prepared important background information for application in investigating other issues in the Basin and Range Region. Specifically, the budgets, cattle numbers and input-output analysis have broad applications to issues that are critical to the Basin and Range Region. Our understanding is that this background information is not readily available elsewhere in one place.

Fall grazing of cheatgrass leads to restoration of traditional range vegetation. This increase in vegetation can make "room" for increasing the cattle numbers, while maintaining improved range conditions, as fall grazing of cheatgrass reduces the stand and density of cheatgrass growth and allows the traditional vegetation to return. We applied such a fall grazing regime in the cow-calf budgets for Elko County to quantify the results of this management practice on costs and returns for ranchers. We found that extended grazing, replacing costlier traditional winter feeds for a two+ month period, will measurably increase ranchers' bottom lines.

The transition from cheatgrass infested land to traditional vegetation will not occur within one year. Fall grazing of cheatgrass might require several years to convert land back to traditional range vegetation. We show probabilities for this transition back to traditional range vegetation. Clearly, these transition possibilities depend on the stand and density of cheatgrass and systematic grazing in the fall until the cheatgrass is grazed sufficiently for the traditional vegetation to return.

There are other methods of controlling cheatgrass. One example is spraying of the annual growth of cheatgrass. But, there is a problem here. Unfortunately, the annual spraying of cheatgrass does not remove the thatch from previous years. Green stripping is another control mechanism (Pellet1994) This leaves the cheatgrass with a strong medium for generating a new stand of cheatgrass, since the thatch is a very good medium for starting and in fact incubating. cheatgrass. Still another approach is the burning of cheatgrass. This reduces the thatch but is risky in terms of spreading to other range.

Finally, there are biological controls of cheatgrass. This is a promising new approach but not suited for range application on a large scale at the current time.

9. Footnotes

1. This paper draws on a report to the Public Lands Council titled "An Economic Analysis of Cattle Numbers and Feed sources in the USDA" which is available on the web page of the UCED at the University of Nevada, Reno. This web page contains all of the appendices listed in the report, which are available to the public but are too long for inclusion in this paper.

2. The AUM numbers in this analysis were from three sources: 1. the BLM data is from the Rangeland Administration System (RAS) for all states in the Basin and Range Region (Appendix G), 2. the Forest Service AUM and grazed cattle data is from the U.S. Forest Service, *Grazing Statistical Summary* for all states in the Region (Appendix H), and 3, the total Federal AUMs are aggregated from the data in these two reports (Appendix I) . (These appendices are available on the UCED web site at the University of Nevada, Reno) This section will examined each of these appendices in order and attempt to explain their implications for this study. We were unsuccessful in achieving this goal since the numbers were not comparable and there was also private grazing. We suggest that the agencies use the beef cow numbers of the NASS, which are national and more directly referenced.

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