ECONOMIC ANALYSIS OF MANAGEMENT OPTIONS FOLLOWING A CLOSURE OF BLM RANGELAND DUE TO SAGE GROUSE POPULATION IN ELKO COUNTY, NEVADA
Economic Analysis of Management Options Following a Closure of BLM Rangeland Due to Sage Grouse Population in Elko County, Nevada

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Economic Analysis of Management Options Following a Closure of BLM Rangeland due to Sage Grouse Population in Elko County, Nevada

Introduction

Ranchers throughout the West who lease federal rangeland for part or all of their grazing land are dependent upon the US Forest Service (USFS) and US Bureau of Land Management (USBLM) to determine the number of animal unit months (AUMs) they can run each year. The number of AUMs permitted on federal rangeland is determined by USFS and USBLM based on range conditions and other factors such as fire and wildlife presence. There is a growing probability that the United States Fish and Wildlife will add the sage grouse endangered species list. In Nevada and across the West, ranchers have experienced grazing seen grazing land limits because of the sage grouse and adding it to the endangered species list.

The uncertainty of how much rangeland must be idled after the addition of the sage grouse to the list has forced ranchers to consider alternative range management options. The most frequently discussed management options include:

- reduce the herd size,
- lease more rangeland and maintain herd size, and
- retire.

Certainly the amount of rangeland permits the rancher loses because of sage grouse habitat affects the ranchers’ decision. A small reduction will allow the rancher to maintain most of his cowherd. Larger reduction caused by sage grouse habitat that would cover most of the federal grazing land could encourage ranchers make large reductions in herd size or retire.
The objective of this paper is to analyze the economics of alternative range management options for ranchers in Nevada following the addition of sage grouse to the endangered species list and they have reductions in grazing permits.

Elko County, Nevada was selected for the analysis because the region has suffered several large range fires over the past ten years. A panel of ranchers representative of full-time, moderate to large cow/calf operations in the region was interviewed to obtain specific information for the analysis. The panel has been interviewed semi-annually for the past ten years by the Texas A&M Agricultural and Food Policy Center to obtain the production data and costs for a representative ranch in Northeast Nevada. The representative ranch has been used for numerous policy analyses, e.g., Richardson, et. al (2013). The methodology for the analysis involves simulating the representative ranch for alternative range management options using the Farm Level Income and Policy Simulation (FLIPSIM) model developed by Richardson and Nixon (1986).

**Range Management Options**

Interviews with ranchers in Elko County, Nevada on the subject of range/herd management after a habitat protection reduction of rangeland grazing indicated that the least preferred option ranchers would consider was reducing herd size but that it was the likely option for permanently grazing permits.

Leasing additional grazing land is an option but one which is not feasible as rangeland in Elko County is fully occupied and the same is true for most of the rangeland in the Western states. Additionally, leasing rangeland incurs added costs of transportation, management, and loss in performance from grazing rangeland unfamiliar for the cattle.
Representative Ranch

The representative ranch in Elko County, Nevada has 650 mother cows, 100 replacement heifers, and 38 bulls. The ranch raises its replacement heifers, has a 96 percent calf crop on bred cattle, and culls 10 percent of the cows each year. The ranch has 1,300 acres of meadow hay which has an average yield of 1.75 tons per acre. The owned pastureland is 8,725 acres and the ranch leases 5,450 AUMs of grazing; 4,500 AUMs leased from the government and 1,000 AUMs leased from private landowners. Costs of production for the ranch are provided by the panel and are summarized as: $226 of variable costs per cow and $364 of fixed costs per cow per year.

The representative ranch is simulated for a ten year planning horizon assuming initial long-term debt is one percent and intermediate term debt is five percent. Debt to purchase an irrigation pivot and additional haying equipment is financed for five years and the debt is added to the ranchers initial assumed intermediate term debt.

Scenarios Analyzed

The percentage of grazing permits that would be reduced because of habitat protection is unknown. Because the loss of rangeland is an exogenous variable, a number of scenarios are analyzed. The following scenarios were simulated to accommodate the range of possible re-entry conditions.

- Base scenario has habitat protection closures on federal land.
- 10 percent of federal land is closed for habitat protection permanently.
- 20 percent of federal land is closed for habitat protection permanently.
- 30 percent of federal land is closed for habitat protection permanently.
- 40 percent of federal land is closed for habitat protection permanently.
- 50 percent of federal land is closed for habitat protection permanently.
- 60 percent of federal land is closed for habitat protection permanently.
- 70 percent of federal land is closed for habitat protection permanently.

- 80 percent of federal land is closed for habitat protection permanently.

The herd would be reduced by the same percentage as the federal land reduction (Table 1.)

Under each scenario the number of mature cows, bulls and replacement heifers kept is reduced by the same percentage to maintain the same herd dynamics at the lower herd size. The cows and bulls were sold in 2014 to reduce the herd size going forward.

Table 1. Herd Dynamics for Acreage Reductions

<table>
<thead>
<tr>
<th>Herd Reduction</th>
<th>Cows</th>
<th>Bulls</th>
<th>Replacement Heifers Kept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>650</td>
<td>38</td>
<td>100</td>
</tr>
<tr>
<td>10%</td>
<td>585</td>
<td>35</td>
<td>90</td>
</tr>
<tr>
<td>20%</td>
<td>520</td>
<td>31</td>
<td>80</td>
</tr>
<tr>
<td>30%</td>
<td>455</td>
<td>27</td>
<td>70</td>
</tr>
<tr>
<td>40%</td>
<td>390</td>
<td>23</td>
<td>60</td>
</tr>
<tr>
<td>50%</td>
<td>325</td>
<td>19</td>
<td>50</td>
</tr>
<tr>
<td>60%</td>
<td>260</td>
<td>16</td>
<td>40</td>
</tr>
<tr>
<td>70%</td>
<td>196</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>80%</td>
<td>130</td>
<td>8</td>
<td>20</td>
</tr>
</tbody>
</table>

**Economic Model**

FLIPSIM is a firm level simulation model that simulates the annual production, marketing, financial, tax, and cash flow for a ranch (or farm) over a 10 year planning horizon. The model simulates annual beef production using empirical distributions for calving rates and weaning weights provided by the ranch panel. Annual cattle and hay prices for the representative ranch are simulated by localizing stochastic cattle prices developed by the Food and Agricultural Policy Research Institute (FAPRI) in their August 2013 Baseline.

The number of federal AUMs available to the ranch has ranged from 1,723 to 6,200 with an average of 4,500 over the past ten years in the absence of delayed re-entry due to fire. To incorporate the risk for federal AUMs an empirical probability distribution for AUMs was added to FLIPSIM. Data to fit the distribution was provided by the representative ranch panel. The representative ranch panel
also provided 10 years of meadow hay yields. Meadow hay is used to supplement the random loss of federal AUMs and to provide supplemental feed. FLIPSIM simulates annual meadow hay yields using a multivariate empirical distribution fitted to ten years of actual yields for ranches in Elko County, Nevada.\(^1\) Alfalfa hay is purchased in the model if the meadow hay production is less than the feed required by the herd.

The base costs of production provided by the ranch panel were inflated over the planning horizon using annual inflation rates in the August 2013 FAPRI Baseline. Interest rates for the analysis are the annual FAPRI Baseline interest rates plus a basis adjustment for the local market. Similar adjustments were made to adjust FAPRI's stochastic annual national cattle and hay prices to the Nevada market assuming the average basis for the past three years remains constant in the future.

The FLIPSIM model simulated the ranch for ten years and repeated the planning horizon 500 iterations. Each iteration used a different draw of stochastic prices, yields, and AUMs. The key output variable reported for this paper is the average annual net cash farm income (NCFI). The NCFI equals total receipts minus total cash production expenses. Cash outlays not included in NCFI are: family living withdrawals, federal income taxes, social security and Medicare contributions, and principal payments.

### Results

The average annual NCFI for 2014-2020 and standard deviation of NCFI for the base scenario without habitat protection are $65,020 and $39,590, respectively (Table 2). The average annual NCFI ranges from negative $78,810 to $156,660. The Ending Cash in 2020 and the standard deviation of Ending Cash in 2020 for the base is negative $417,490 and $249,280, respectively. Ending Real Net

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\(^1\) The multivariate empirical distribution simulation methodology is described by Richardson, Klose, and Gray (2000).
Worth for the base scenario with no reduction in federal grazing land ranges from a minimum of $6.989 million to $9.284 million with an average of $8.17 million.

The results for the 8 scenarios are also summarized in Table 2. A 10 percent reduction in herd due to a 10 percent reduction in federal grazing land reduces the average annual NCFI to $44,880 from $65,020 and decreases the Ending Real Net Worth in 2020 to $7.975 million from $8.17 million. A further reduction to 80 percent of original herd size and the average annual NCFI drops to $22,000, with all other scenarios averaging negative annual NCFI. A reduction in federal grazing land of 80 percent, dropping the cow herd from 650 cows to 130 cows reduces the average annual NCFI to negative $133,320 and a Ending Real Net Worth of $6.173 million, or a 24.5 percent decrease over the base. The results for the reduce herd size scenarios indicate that the more extensive the habitat protection, the lower the average annual NCFI. These results indicate that if a ranch is forced to reduce herd size considerably, it may be better off financially to retire.

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
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</thead>
<tbody>
<tr>
<td>NCFI 2014-2020</td>
<td>65.02</td>
<td>44.88</td>
<td>22.00</td>
<td>-2.93</td>
<td>-27.59</td>
<td>-54.32</td>
<td>-82.03</td>
<td>-105.87</td>
<td>-133.32</td>
</tr>
<tr>
<td>Std Dev</td>
<td>39.59</td>
<td>38.69</td>
<td>37.99</td>
<td>37.46</td>
<td>37.35</td>
<td>37.21</td>
<td>36.97</td>
<td>36.99</td>
<td>37.32</td>
</tr>
<tr>
<td>Min</td>
<td>-78.81</td>
<td>-77.79</td>
<td>-117.84</td>
<td>-142.37</td>
<td>-166.39</td>
<td>-191.64</td>
<td>-217.27</td>
<td>-239.93</td>
<td>-265.49</td>
</tr>
<tr>
<td>Max</td>
<td>156.66</td>
<td>138.13</td>
<td>115.69</td>
<td>91.89</td>
<td>68.91</td>
<td>42.04</td>
<td>13.54</td>
<td>-11.92</td>
<td>-39.77</td>
</tr>
<tr>
<td>Ending Cash In 2020</td>
<td>-417.49</td>
<td>-541.11</td>
<td>-681.06</td>
<td>-835.74</td>
<td>-1,005.22</td>
<td>-1,211.17</td>
<td>-1,429.94</td>
<td>-1,613.92</td>
<td>-1,827.95</td>
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<tr>
<td>Std Dev</td>
<td>249.28</td>
<td>241.27</td>
<td>243.77</td>
<td>246.23</td>
<td>252.52</td>
<td>252.90</td>
<td>245.90</td>
<td>240.06</td>
<td>238.95</td>
</tr>
<tr>
<td>Min</td>
<td>-1,237.05</td>
<td>-1,464.48</td>
<td>-1,526.89</td>
<td>-1,729.23</td>
<td>-1,938.04</td>
<td>-2,155.71</td>
<td>-2,378.81</td>
<td>-2,568.74</td>
<td>-2,786.45</td>
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<tr>
<td>Max</td>
<td>195.39</td>
<td>19.43</td>
<td>-128.88</td>
<td>-212.43</td>
<td>-340.21</td>
<td>-553.82</td>
<td>-801.60</td>
<td>-1,013.83</td>
<td>-1,249.25</td>
</tr>
<tr>
<td>Std Dev</td>
<td>393.30</td>
<td>375.36</td>
<td>369.37</td>
<td>364.36</td>
<td>356.35</td>
<td>347.34</td>
<td>333.33</td>
<td>318.30</td>
<td>306.90</td>
</tr>
<tr>
<td>Min</td>
<td>6,989</td>
<td>6,941</td>
<td>6,720</td>
<td>6,493</td>
<td>6,268</td>
<td>5,979</td>
<td>5,662</td>
<td>5,411</td>
<td>5,173</td>
</tr>
<tr>
<td>Max</td>
<td>9,284</td>
<td>9,058</td>
<td>8,809</td>
<td>8,582</td>
<td>8,299</td>
<td>7,961</td>
<td>7,612</td>
<td>7,288</td>
<td>7,035</td>
</tr>
</tbody>
</table>
Summary

Habitat protection for the sage grouse in the West is a significant problem for the economic viability of ranches due to the potential permanent loss of thousands of acres. Ranchers who depend on federal land grazing for part or all of their pasture are limited in their management options when habitat protection prevents their use of federal land. Reducing the herd or retiring is their remaining options, due to limited available private land for lease.

The purpose of this study was to analyze the economic consequences of reducing the herd size on a representative ranch in Northeast Nevada if the ranch was faced permanent loss of federal rangeland due to habitat protection for sage grouse. An economic model of a representative ranch with 650 mother cows in Elko County, Nevada was used to analyze alternative scenarios of decreasing herd size as the federal grazing land was reduced due to habitat protection.

The results showed that should the ranch be forced to reduce the herd size by more than 25 percent, the ranch might have to look at ways to retire or acquire more private or owned land to survive.

The protection of the sage grouse at the cost of grazing land for cattle in the West could have a significant negative impact on the livelihood of ranchers across the region and the supporting industries.
References


