Ranch-Level Economics: What We’ve Learned

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Look Back and Look Forward

- Economic Theory
- Benefits and Costs
- Seed Mixes & Non-Use
- Economic Impact of Fire
- Ranch-Level
- Others
Economic Theory and Benefit-Cost Analysis: An Application to Wildfires
Economic Analysis

- Stream of benefits and costs over time
  - Upfront costs for suppression and rehab
  - Market and Non-Market benefits and costs
  - Ranch-level (revenue, expenses, profits)
  - Others: Social Structure, Open Space, etc.

- The necessity to discount future dollars

- Are Benefits > Costs? (NPV)
Discounting Future Benefits and Costs

- $PV = C_0 + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_n}{(1+r)^n}$

- $r =$ discount rate (%)

- $C_n =$ cost in Year $n$

- NPV = Net Present Value (difference between benefit and cost streams)
Forage Values

AUM Value

$/AUM

$0.00 $0.50 $1.00 $1.50 $2.00 $2.50 $3.00 $3.50

$0.00 $2.00 $4.00 $6.00 $8.00 $10.00 $12.00 $14.00 $16.00

Year

Acre Value

$/ac

$0.00 $0.50 $1.00 $1.50 $2.00 $2.50 $3.00 $3.50

$0.00 $2.00 $4.00 $6.00 $8.00 $10.00 $12.00 $14.00 $16.00

Year
Net Present Value

- Present Value of the Stream of Livestock Grazing Values amounts to about $36.70/acre ($15/AUM, 5 acres/AUM and 5% discount rate with 2 years of non-use)
## Seeding

### Thurbers Site

<table>
<thead>
<tr>
<th>Species</th>
<th>Rate (lbs/ac)</th>
<th>Cost/Unit</th>
<th>Cost/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandbergs Bluegrass</td>
<td>1.1</td>
<td>$ 7.88</td>
<td>$ 8.67</td>
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<tr>
<td>Bottlebrush Squirreltail</td>
<td>3</td>
<td>$ 24.99</td>
<td>$ 74.97</td>
</tr>
<tr>
<td>Bluebunch Wheatgrass</td>
<td>2.5</td>
<td>$ 7.79</td>
<td>$ 19.48</td>
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<tr>
<td>Lewis Flax</td>
<td>0.1</td>
<td>$ 14.44</td>
<td>$ 1.44</td>
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<tr>
<td>Alfalfa</td>
<td>0.5</td>
<td>$ 2.18</td>
<td>$ 1.09</td>
</tr>
<tr>
<td>Sainfoin</td>
<td>1.36</td>
<td>$ 2.01</td>
<td>$ 2.73</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.56</strong></td>
<td><strong>$ -</strong></td>
<td><strong>$ 108.38</strong></td>
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</tbody>
</table>

## Non-Use Period and Impact on NPV

<table>
<thead>
<tr>
<th>Mix</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>5</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thurbers</td>
<td>-63.10</td>
<td>-66.10</td>
<td>-71.68</td>
<td>-79.09</td>
<td>-85.49</td>
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<tr>
<td>WSA</td>
<td>-24.45</td>
<td>-27.45</td>
<td>-33.03</td>
<td>-40.44</td>
<td>-46.84</td>
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<tr>
<td>Crested Wheat</td>
<td>16.27</td>
<td>13.27</td>
<td>7.69</td>
<td>0.28</td>
<td>-6.12</td>
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<tr>
<td>Forage Kochia</td>
<td>7.57</td>
<td>4.57</td>
<td>-1.01</td>
<td>-8.42</td>
<td>-14.82</td>
</tr>
</tbody>
</table>
Economic Theory Summary

- Economics should be a critical part of the decision process.
- Expensive up-front costs (seed) are not covered by livestock benefits over time.
- Non-market benefits and costs must be developed and quantified (ecosystem services).
- Non-use period post-fire needs careful examination (case by case).
Ranch Level Impacts

Anna Maher: OSU MS Thesis:

- The Economic Impacts of Sagebrush Steppe Wildfires on an Eastern Oregon Ranch
- Multi-period Linear Programming Model used to estimate impacts on the NPV of income stream associated with a 300 head ranch (40 year planning horizon)
- Alternative Fire Frequencies (Monte Carlo)
- Cattle, income, expenses, forage used
Ranch Level

- Constant Prices and Precipitation
  - No variation from year to year
    - High, Average, Low scenarios
  - Goal was to isolate the economic impact of alternative fire frequencies
  - Base Model (no fires)
  - Fire Model (varied based upon the Monte Carlo simulation—1-2 fires/40 years)
  - Comparisons of NPV, bankruptcy (infeasible)
Fire occurs in Year 17
Impact on Net Income continues to Year 20
 tied to 2 years of non-use after the fire
Two fires in planning horizon also negatively impacts net ranch income
NPV of the income stream of ranch is negatively impacted by fires and non-use period, post-fire
Number of Infeasible (Bankruptcy) Solutions by Number of Fires

Number of Infeasible Solutions

- High Prices
- Average Prices

Number of Fires

1 Fire

2 Fires

Number of Infeasible Solutions
In both average and high price scenarios:
Rangelands most dominated by cheatgrass result in less ranch income: tied to fires and frequency
Ranch-level Conclusions

- Models indicate that fire has negative impact on ranch income.
- Models also indicate that increased fire frequency increases the chance of bankruptcy (infeasible solutions).
- Alternative forage sources are limited and expensive.
- Non-use period following fire needs careful consideration.
“If you lose your federal grazing, you gotta try to survive or you’re gonna hammer your private ground for awhile until you just can’t make it work. So then, somebody with a small place like mine is going to think – ‘now, this is stupid, I could make big bucks selling out to a developer,’ and there goes the wildlife habitat and everything else.”

Anon. IRRC Focus Groups. 2007
“Well, from our perspective, I think we’ve got to educate the public too and fires aren’t all bad. There’s the right place and right time, and I’d like to see that addressed. [Fire] is a great tool if used correctly. We do get flack about the smoke in some areas… But this is the key to educate people: rangeland’s for everybody, cattlemen, hunters, rock hounds, whatever. It’s a good resource and we need to protect it.”

Anon. IRRC Focus Groups. 2007
**Summary**

- **B/C Analysis**—need to develop estimates of benefits and costs of fires
  - Probability
  - Non-use period
  - Non-Market Values
  - Community Social Structure & Open Space

- **Ranch-level impacts**
  - Cheatgrass and fires reduce ranch income
Questions?